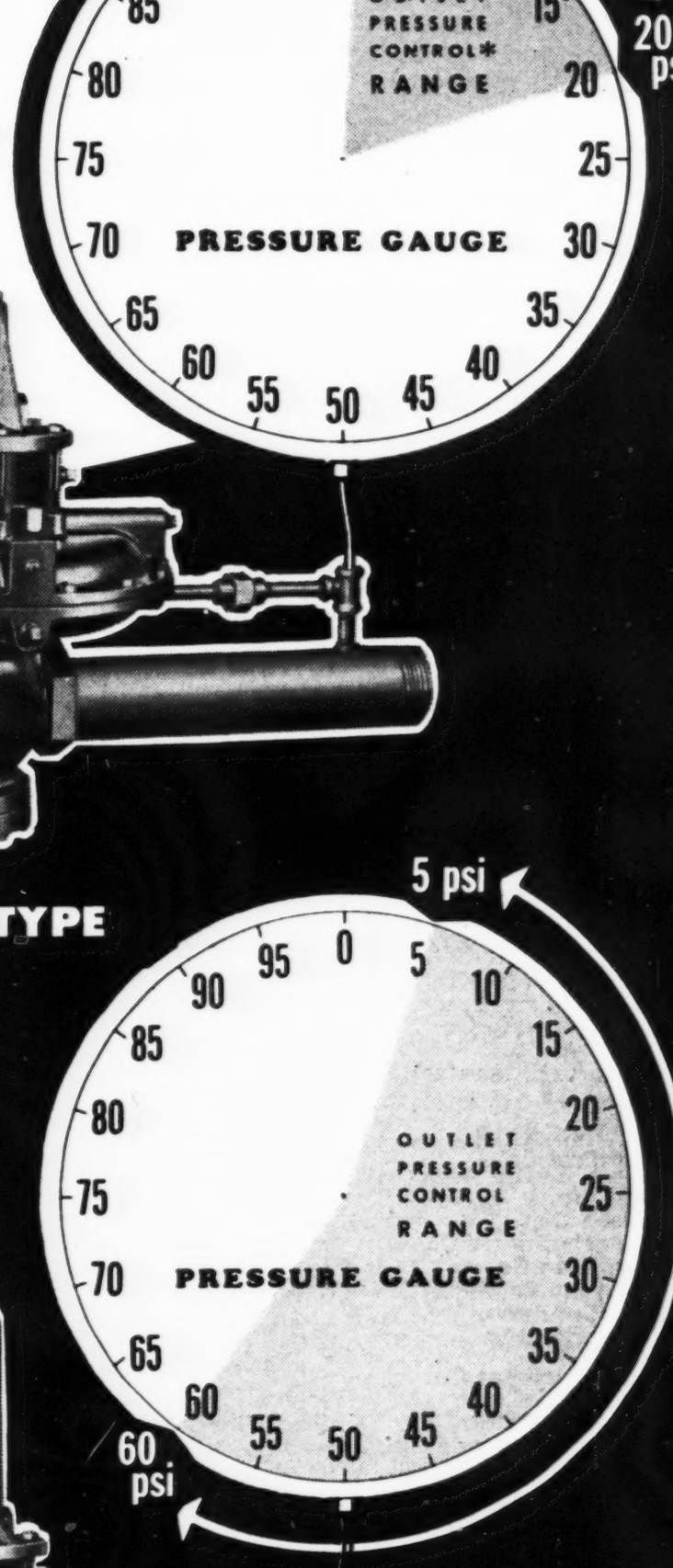
EMCO "1001" REGULATORS

GIVE

EXTREME CONTROL ACCURACY

OVER WIDEST OUTLET

PRESSURE RANGES



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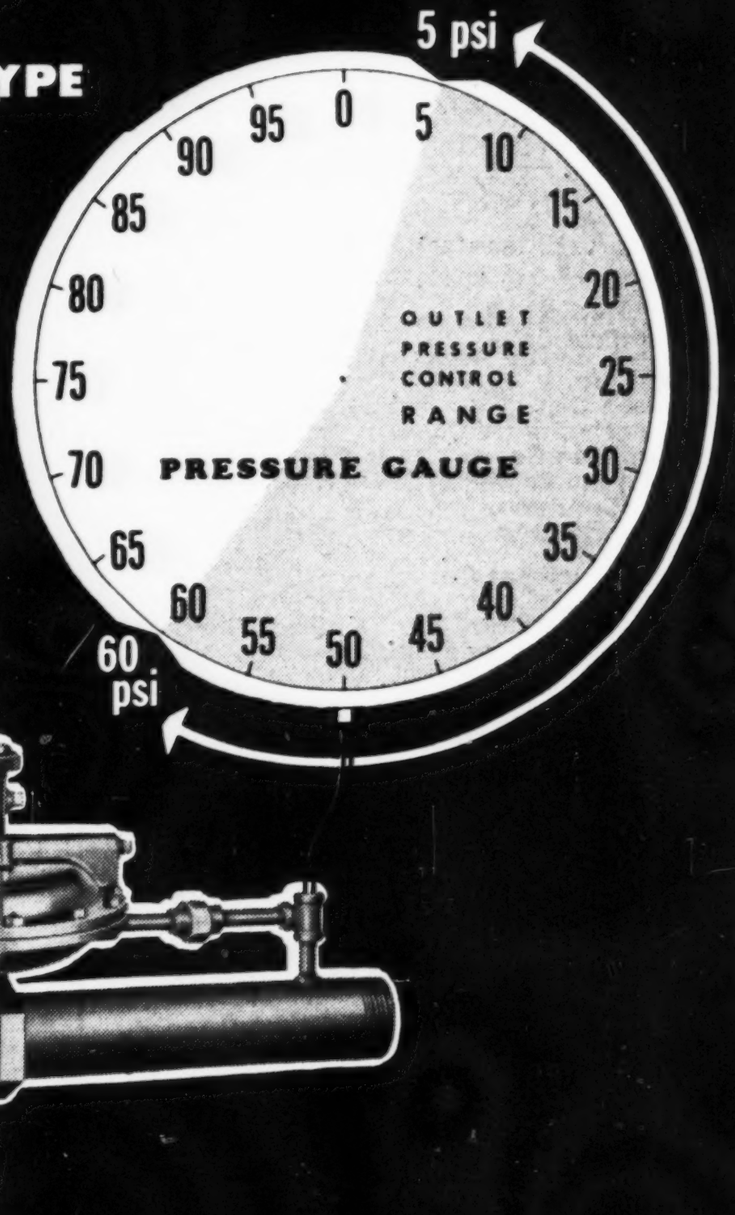

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GAS

REG. U. S. PATENT OFFICE

Twenty-Fifth Year of Publication

February, 1949 CCA NBP ASSOCIATION **Vol. 25—No. 2**

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Highlights

SNOW-MELTING SYSTEM FOR HIGHWAYS NEXT? Installing snow-melting systems, using warm water circulated through pipes, to clear sidewalks and driveways is small potatoes now. Oregon is using the method to clear snow and ice from a stretch of highway. With its 8% grade too steep for safety under bad weather conditions, a 450-ft stretch of highway is being de-iced. A solution, circulated through pipes submerged in hot water natural springs, at 190° temperature, is piped through 15,000 ft of ¾-in. wrought iron pipe buried in 8-in. concrete. It was the cheapest way, engineers decided.

TRUNKLINE DOCKET GETS HEARING. FPC was due to begin hearing Trunkline Gas Supply's application for a Louisiana-Iowa line Feb. 1. The Mesabi Pipe Line Co. application, formerly consolidated with Trunkline's, was severed in a last-minute move.

THE PETROLEUM INDUSTRY'S HASN'T BEEN ASLEEP WHEN IT COMES TO GETTING STEEL. In the first nine months of 1948, oil and gas industries received 3,125,000 tons of steel, an increase of 38% over 1947's figures, the American Iron and Steel Institute says. Overall shipments—to all consumers—were up 4%. The gas industry's receipts were over 7% of the total for the period.

"COURT OF FLAME" NOW IN SESSION. Two million water heaters will be sold in 1948 by utilities and cooperating dealers, if the AGA-GAMA drive comes up to expectations. In a 12-month drive, thousands of dollars in bonds and two Buicks will be given away in an effort to stimulate sales. It's the biggest water-heater promotion of all time.

STANDARD GAS UNDER SEC FIRE. Standard Gas & Electric Co., Chicago holding company, has been told to dissolve or go on an all-common basis. The choice was given because there is an appeal pending on an SEC order affecting Philadelphia Co., a Standard Gas subsidiary. The Philadelphia Co. had been told it must liquidate. The commission said the corporate structure of Standard Gas is "unnecessarily complicated."

FPC STANDS FAST ON DELHI STATUS. We still won't say you're not a natural gas company, said the commission last month, in reply to Delhi Oil Corp.'s second amendment to an application to have its position determined. Delhi, which with El Paso Natural set up the San Juan Pipe Line Co. to carry gas for the proposed New Mexico-San Francisco line, offered to sell common and preferred stock in San Juan before gas was transported in it, but it was still no dice. The proposal has not changed materially, said the commission.

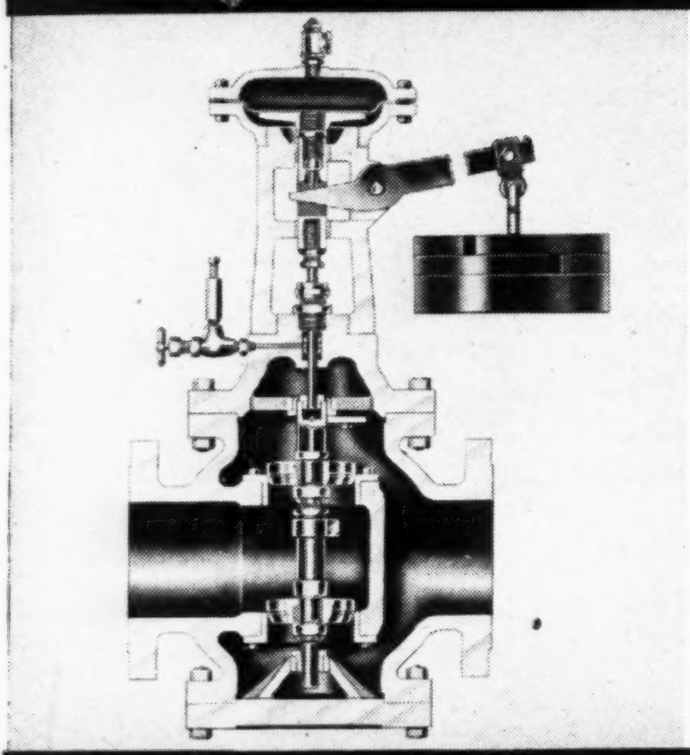
TEXAS GAS TRANSMISSION HAS THE MONEY READY FOR IT'S LINE TO OHIO. In the FPC hearing last month on its application for an 800-mile line, Vice President W. T. Stevenson said it has sold $60 million of bonds to cover its needs. The money's in escrow pending outcome of the application.

FPC BLOCKED IN PANHANDLE MEDDLING. The Third Circuit Court of Appeals upheld a lower court's refusal to permit the commission to block Panhandle Eastern Pipe Line Co. from paying a dividend of 810,000 capital shares of Hugoton Production Co. to its stockholders. The transaction, in effect, would transfer ownership in the company's gas lease. Since the FPC had okayed a rate structure and had issued a certificate on the basis of the lease, it held that it had jurisdiction over the sale. FPC overstepped the limits of the Natural Gas Act, the court decided.

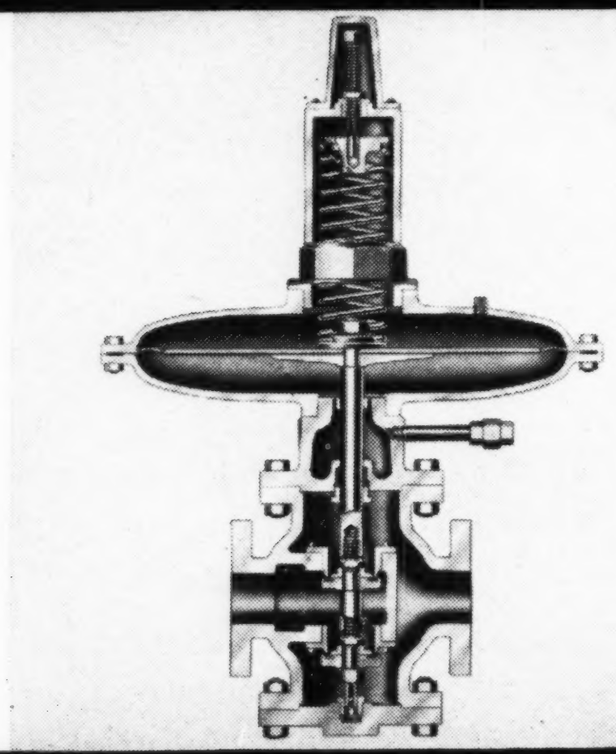
BUCHANAN NOMINATION GOES TO THE SENATE AGAIN. In mid-January, the President sent to the Senate the nomination of Thomas C. Buchanan of Pennsylvania to the Federal Power Commission. Buchanan, who failed to win confirmation last summer but is now serving an interim appointment, faces a greatly improved prospect this session.

RIGHT TO RESTRICT GAS SERVICE UPHELD. The supreme court of the state of Ohio last month upheld a lower court refusal to issue an injunction against the East Ohio Gas Co. from shutting off service to a house heating customer. Joseph C. Ruhlman of Akron, who had installed a gas furnace in his home after being denied authority to do so by the company, had brought the suit. The company had notified him it would cut off service to his residence after he had installed the furnace, and was upheld in its decision by the public utilities commission.

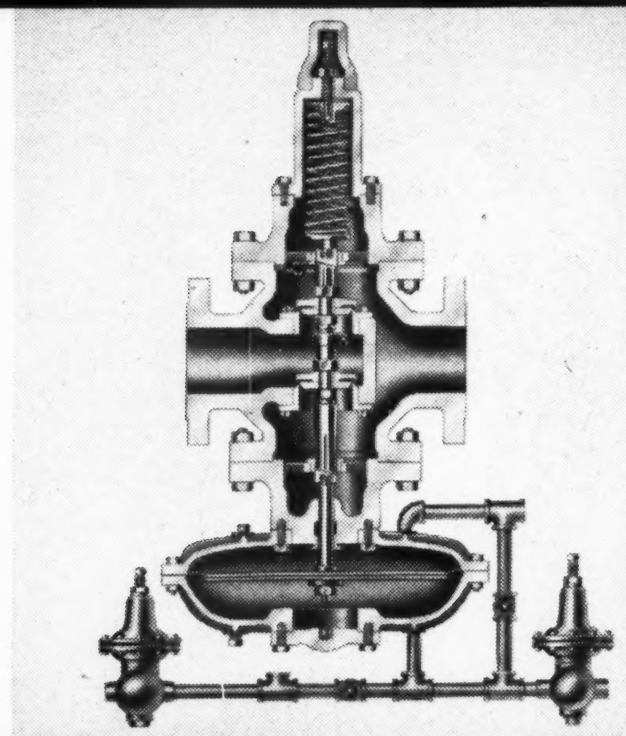
Chaplin Fulton Pressure Regulators



For general pressure reduction service. Sizes 2″-12″ standard, 16″-24″ special. Flanged body assemblies in cast iron for 100 lb. or 600 lb. W.P. —cast steel for 1200 lb. W. P. Controlled Pressure Range—ounces to 200 lbs. All flanged construction—lubricated stuffing boxes—removable orifices—balanced valve assemblies interchangeable—hard seat, soft seat or reduced size—all center guided.



A dependable, accurate regulator for distribution service, large industrial or commercial applications, boilers, industrial furnaces, dehydrators, etc. Sizes 2″-6″, flanged F&D 125 lb. body assembly for 100 lb. W.P. Controlled Pressure Range —ounces to 50 lbs. Can be furnished as zero governor. Removable orifices, soft seat balanced valve construction, easily adjustable and removable. Springs colored for identification.



An accurate efficient pressure loaded regulator for high or low pressure service. Town border settings, compressor fuel lines, transmission measuring stations, large industrial installations. Sizes 2″-12″, flanged for 100 lb., 600 lb., or 1200 lb. W.P. Controlled Pressure Range—ounces to 400 lbs. All flanged construction. MODEL 44 PC—closes on pilot pressure failure. MODEL 44 PO—opens on pilot failure.

OTHER BALANCED VALVE TYPES

Model 44D Duplex Gas Regulators
Model 44B Back Pressure Regulators
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Vacuum and Differential Regulators
Model 46 Industrial Furnace Regulators
SENSITROL Pilot Loading Systems

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H.P. Field Regulator Type 101
House Regulators with Cut-off
H.P. Spring Regulator Type 118
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THERMALLY THINKING

Vital Proceeding

THERE are some dangerous precedents affecting both consumers and industry in a recent decision of FPC Presiding Examiner Emery J. Woodall. It concerns distribution of 75 MMcf of gas a day originally contracted for by the Consolidated system, including East Ohio Gas Co., The Peoples Natural Gas Co., and New York State Natural Gas Co.

At present writing, this decision still awaits confirmation by the Federal Power Commission itself. The mayor of Cleveland and other Ohio authorities are thoroughly aroused over it. The Cleveland *Plain Dealer* suggests that the issues involved will be tested up to the Supreme Court of the United States.

The most basic issue is the freedom, within reasonable limitation of public interest, for an individual or company to go out and make normal business agreements and contracts, with the expectation that they will be carried out. Then the individual or corporation can go ahead and in turn make other commitments based on the original contracts.

The facts are as follows: (data here is for East Ohio, but similar principles apply to Peoples in western Pennsylvania.)

For the first 40 years of its 50 years of operation, East Ohio produced and purchased gas in Ohio, and made long term contracts for gas purchased in West Virginia. In 1943 East Ohio contracted with Panhandle Eastern Pipeline Co. for the first southwestern gas to enter the Appalachian area. Later contracts were signed and approved by the FPC to secure gas from Tennessee Gas Transmission Corp. and Texas Eastern Transmission Corp.

Following the same general procedure, East Ohio and the others in the Consolidated group signed a contract with Texas Eastern to take an additional 75 MMcf.

This 75 million is the gas in dispute, about which the examiner wrote his decision.

In connection with this contract, East Ohio back on Aug. 6, 1947, applied to the FPC for a certificate of public convenience and necessity to build, at an estimated cost of $3.5 million, 84 miles of 20-in. pipeline. It would extend from its storage facilities near Canton to a connection in the southern part of Ohio, with the Texas Eastern lines.

On Nov. 12, 1947, the FPC granted East Ohio a certificate to build the line, saying that the facilities and gas were needed and pointing out that East Ohio was entitled under the contract with Texas Eastern to take additional quantities of gas as soon as Texas Eastern enlarged its facilities.

The examiner's report, which was adopted by the FPC when it authorized this line, contained many arguments indicating the necessity of the line. The line was actually built at the $3.5 million cost, and completed in the fall of 1948, in anticipation of receiving the additional 75 MMcf of gas a day.

Then came a change.

On Feb. 15, 1948, Texas Eastern had applied to the FPC for a certificate. They sought to construct and operate pipeline facilities to supply East Ohio and the other companies. They referred to the agreement with East Ohio and its affiliates pursuant to which they proposed to sell and deliver the entire additional amount of gas to be made available by the increase in the capacity of their system.

Numerous intervenors were admitted to the proceedings.

And the presiding examiner made a decision ordering Texas Eastern to supply gas to all the principal gas companies which intervened. The order did not even list East Ohio and the other companies of the Consolidated group. But by inference they might be entitled to what was left after taking care of the numerous others.

What the Principle Means

One would be hard-hearted indeed if one did not recognize that most and possibly all of these intervening companies needed relief badly. But customers of the Consolidated companies need the gas badly too.

It would be rash to attempt to say which needed the gas worse. The principle is the important thing.

A parallel case might be that of a man who starts to build a house. He spends some thousands of dollars on plans, foundations, architects' fees, and tosses in a lot of his own time and thought. The foundation is built and the materials contracted for. Then out of a clear blue sky a government official steps in from Washington, and says that John Jones down the street needs the house more than he does, so his building plans will have to be deferred indefinitely, and his family out of a home.

We are informed that the current decision which is awaiting FPC and possibly high court action, if the FPC itself adopts it, will be the first in which the commission will have permanently voided a firm original contract of this type.

If carried to the ultimate extreme it would be like a housewife on her way home with a peck of apples, being stopped by an official who says, "No, you can't have those, they'll have to be sold to Mrs. Jones down the street, because her family needs the apples more than yours does."

It's not a case where Mrs. Jones' family is starving. They can get turnips or another kind of apples and get their vitamins. But the government official, at his own discretion steps in. If the American people want that kind of all-ruling paternalistic government, okay, but let's not have it adopted without plenty of consideration.

To be fair one must mention some of the problems of the companies who intervened, and whom the FPC examiner

favored in his attempted breaking of the contract.

In the case of one of these comparatively small companies, it was stated that unless the company obtained emergency relief, its domestic customers would suffer great hardships in the winter as they did during the last winter.

The financial condition of a second company was shown to raise serious question as to its ability to finance a mixed-gas changeover program. And the company concluded that only with natural gas could it continue to furnish safe, adequate and continuous service at reasonable rates. In the case of a third company, the introduction of natural gas would enable the utility to avoid financial difficulty, whereas otherwise the population of the area might be wholly without gas service in the relatively near future.

Still another company, while not at present in a precarious financial condition, faces progressively less security of service because of mounting costs of production and resulting high rates for gas.

And so on.

Some of the pleas were impressive. The only question is one of principle, and whether the people of this country want the kind of control of industry (except in real emergencies) comparable to the cases of the home builder and the housewife as outlined above.

A Few Effects

Forced change of plans can be a very wasteful process economically. East Ohio for instance had spent a substantial sum on its connecting line. And apparently a large quantity of scarce steel would be required to connect some of the companies in whose favor the examiner ruled.

Against some of the understandable hardship pleas of these companies, the Consolidated companies point out that their consumers and they themselves have comparable problems. The Cleveland newspapers asked why some of the intervening companies could not wait until other pipeline projects, designed to serve their areas were completed.

E. M. Borger, president of Peoples, warned that curtailment of industrial employment and production as great as was experienced during the past two winters, again was in prospect for 160 western Pennsylvania plants.

In denying the East Ohio group the gas contracted for, the examiner stated that "East Ohio proposes to attach, by the end of 1948, 20,000 more space heating customers." But East Ohio asserted these customers already were attached; that the Federal Power Commission itself told them the new connecting line should be built and was needed; and that the gas for these customers, or about 40 MMcf a day was to come from Texas Eastern; and exhibits supporting the application of East Ohio to build the connecting line showed this.

This case involves vital principles to be decided.

Communities Rallied

Public officials, newspapers and civic groups in Ohio and Pennsylvania cities rallied impressively to the common cause with the utilities involved. It was an example of good community relations.

Mayor Burke of Cleveland went to Washington carrying a few bushels of petitions, many of which had been filled out from blanks published in the Cleveland *Press*, reading as follows:

"To Mayor Burke: Will you enter my protest, along with the others, in your fight to get gas to do our cooking, keep our homes warm, and keep Clevelanders on their jobs?"

The Cleveland *Plain Dealer* pointed out that the contract of East Ohio with Texas Gas Transmission provided 110 MMcf a day—and that if a federal agency could order a violation of contract in the case of Texas Eastern, it also could direct that contracts with Texas Gas be ignored.

"The courts," the *Plain Dealer* continued, "have always been slow to declare contracts void except for good cause, such as fraud or lack of consideration, but no contract made by a public utility in good faith will be safe from attack if the authority now assumed by the FPC is upheld."

When East Ohio won a temporary victory in allocation of 37 MMcf of gas pending decision by the commission, the *Plain Dealer* commented:

"There was nothing magnanimous about the Federal Power Commission's decision to let the East Ohio Gas Co. obtain, for the time being at least, 37 MMcf of Texas-produced gas which the company contracted for to have piped here for distribution to its customers.

"For the commission to have done otherwise—to have decided that East Ohio could not have that fuel, pending final FPC ruling whether the gas shall be diverted to Eastern cities—would have made even more untenable than it already is the commission's position in its effort to invalidate private contract by government ukase. . . .

"Whether the victory will become a permanent one may be a matter for the ultimate determination by the United States Supreme Court. If necessary, we hope the East Ohio will challenge right up to the highest tribunal of the land the right of a regulatory commission to penalize the enterprise and foresight of a public utility, and to flout the sanctity of contract."

On another day, the *Plain Dealer* wound up its comment with the observation that:

"What the consumers want is more gas from Texas and less hot air from Washington."

Thank You, Mr. R.!

IT is gratifying to note that the electric people are impressed by the promotion for gas, and are holding up the program of our industry as something to shoot at in their new competing program which will have as its slogan the battle cry "Of Course—It's Electric" as the counterpart of "Gas Has Got It."

There's nothing modest about the ambitions of those on the electric side of the fence.

For example, in the current issue of the Edison Electric Institute Bulletin, Harry Restofski, chairman of the commercial division, general committee, EEI, writes:

"If all kitchens in wired homes were electrified according to today's standards, the additional electric appliances needed would represent a retail market of $35 billion; operation of these appliances would require more than 165 billion kw-hr per year; and they would provide an annual electric service revenue of over $2⅓ billion. And these figures, big as they are, include only the major appliances, the range, water heater, refrigerator, dishwasher, garbage disposer and home freezer."

The All-Electric Kitchen Program is due to get under way soon running competition with the Court of Flame program of the gas industry.

But Mr. Restofski could not skip the darker side of the picture from the electric viewpoint.

"There are competitive forces hard at work attempting to destroy the trend toward the electrical way of living," he warned . . . "I refer, of course, to the drives being launched by the gas and the liquefied petroleum gas industries.

"These campaigns cannot be taken lightly."

We're with you on that last sentence, Mr. Restofski.

TECHNICAL TRENDS

by Guy Corfield

Underground Pipe Coatings

Fiberglas Wrapper. Underground pipe protective applications usually consist of one or more layers of a coating material and a wrapper applied simultaneously and bonded together. The wrappers may serve as an internal reinforcement to strengthen the coating, enable the build-up of thickness and prevent sagging when warm; or they may be applied externally as a physical protection to the underneath coating and to smooth it out and hold it in place until it hardens. A very thick coating is often applied with both an internal and external wrapper.

One of the most recently developed wrappers is Fiberglas, produced by the Owens-Corning Fiberglas Corp. of Toledo, Ohio. This material, also called Fiberglas Mat, is composed of a jackstraw arrangement of fine glass fibers, uniformly dispersed, bonded together to form a thin, highly porous felt-like material. The fibers have an average diameter of 0.0005 in. and are smooth and cylindrical. The mat is built up of layers of fibers well intertwined in random orientation lengthwise and crosswise but not vertically. For underground pipe wrapper the binder used is furfural alcohol, the thickness of the mat is 15 mils, and it is available in 4-in. or multiple width rolls up to 36 in., 450 ft long. The tensile strength is 15 lb per 1-in. width.

The recommended and principal use for Fiberglas in underground pipe coatings is as an internal wrapper to provide reinforcement, particularly with hot-applied bituminous enamels. Machine operation, in either yard or field, is such that an inner layer of hot enamel, the wrapper, and an outer layer of hot enamel are applied in that order and almost simultaneously. The tension on the wrapper partially embeds it in the inner layer of enamel, and the outer layer then covers it and bonds through to the inner layer, the originally porous nature of the wrapper being favorable to this impregnation and bonding action. The net result, if successfully applied, is complete inclusion of the wrapper within a relatively thick layer of enamel, without voids or holidays.

Cooling the Coating. In coating, wrapping and lowering pipe into the ditch in one continuous operation, it is necessary to cool the coating rapidly enough to enable it to carry the weight of the pipe on the bottom of the ditch without deformation. A water spray has been used for this purpose but without complete success as the water only partially wets the surface and runs off rapidly and without exerting the maximum evaporative cooling effect.

Stanolind Pipe Line Co. has solved this problem by the simple but ingenious method of adding a wetting agent to the cooling water. The wetting agent causes the water spray to cling to and wet the entire surface of the coating, and the resultant evaporation produces cooling which it is stated is three times more effective than formerly obtained.

After considerable experimentation the most satisfactory wetting agent was found to be alkyl aryl sulfonate. It is used in amounts of approximately 1½ to 2 lb per mile of pipe.

Keeping the Coating Cool. One of the problems in handling and installing coated pipe above and in the trench, in hot weather, is to avoid damage to the coating because of the softening effect of the sun and atmospheric heat. In fact, in very warm weather, there may be a tendency for the coating to run to the bottom or even slough off the pipe. This tendency is aggravated by the fact that most coatings have a dark and somewhat rough surface, and therefore are ideal absorbers of the sun's rays and reflected heat from the ground.

One rather obvious and generally used means of reducing this absorption of heat is to whitewash the pipe, taking advantage of the well known property of reflection of a white surface, whereby it resists heat absorption rather than encourages it. While it is generally known that whitewashing is surprisingly effective for this purpose, the writer has never seen quantitative results published and therefore the following recently obtained data may be of interest.

Two adjacent 40-ft lengths of 30-in. pipe were selected, lying on the ground in open desert country. They were coated with black bituminous enamel wrapped externally with impregnated asbestos felt. One was whitewashed. Preliminary tests with thermocouple junctions inserted between the coating and the outside pipe wall showed that the temperature at this point was the same as obtained with a recording thermometer with its bulb pressed and taped against the inside pipe wall at the same point. A recording thermometer bulb was so installed inside each pipe, about 30° from the top on the sunny side; and a third recording thermometer bulb was located 18 in. above ground, and shaded, to register atmospheric temperature. Typical results were as follows:

	Maximum	*Minimum*
Black pipe	145°F	58°F
Whitewashed pipe	88	55
Atmosphere	82	63

It will be noted that the black pipe temperature rose to 63°F above atmospheric temperature, whereas the whitewashed pipe only rose 6°F above surrounding air. It will also be noticed that at night both the black and whitewashed pipe *went down below atmospheric temperature.* This demonstrates the phenomenon whereby a surface or object exposed to the sky at night will radiate heat to interstellar space, and attain a temperature below that of surrounding air as measured by a ventilated but covered thermometer.

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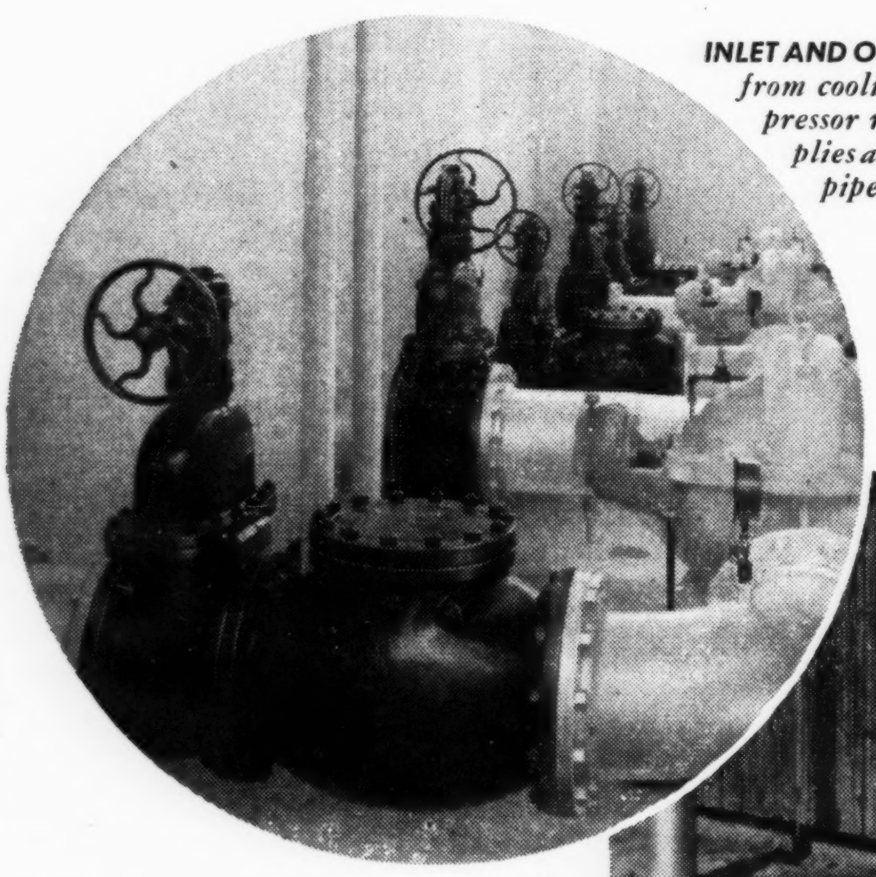
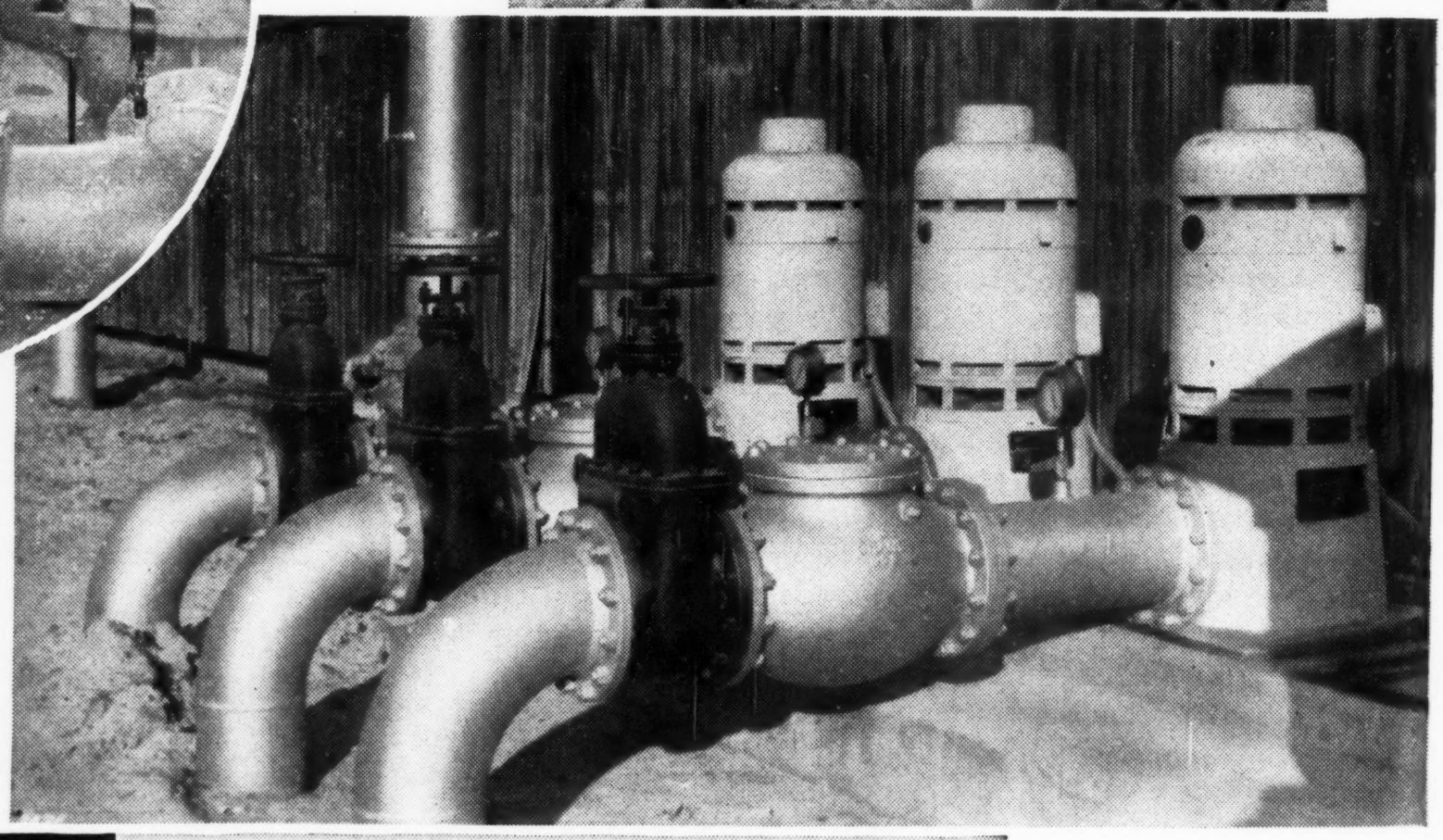


INLET AND OUTLET *water lines from cooling tower to compressor room. Crane supplies all valves, fittings, pipe and pipe bends.*

CRANE BEVEL GEAR OPERATED *12 and 16-in. gate valves, 12-in. check valves on water circulating manifold.*



CIRCULATING PUMPS *to cooling tower in a compressor station featuring Crane Standard Iron Body Double Disc Gate Valves, check valves, flanged fittings.*

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PROMOTIONAL NOTES AND NOTIONS

by Stanley Jenks

Fighting Inflation

THE inflationary cycle has made many of our best operated gas companies do the very last thing that any utility management wants to do—apply for rate increases. In no instance have these modest increases been equal to the general increase in living costs, or even to the increases in the costs of the components making the increases necessary. Our gas industry, therefore, can be justly proud of its part in holding the line against the forces of inflation, which must be checked—and soon—if our American economy is to be preserved and our dollar saved from the fate that befell the Russian ruble, German mark, French franc, and Italian lira.

Fuel is such an essential ingredient in our national picture that any industry selling it at an annual rate of better than $1.5 billion can and does materially influence the general situation.

But, could we have done so well ratewise if we had not aggressively promoted our business in the pre-war era? The answer is obvious. With such large capital investments in service facilities, load-building is the only sound way to make reductions possible without jeopardizing earnings. In fact, it has been proved time and time again that a gas company can substantially reduce its rates and increase its net where and when it intelligently promotes its services by enlisting and organizing the active cooperation of all who can help, rather than trying to corral every dime of merchandising profit (sic) for itself.

Interesting Research Results

EMPLOYEE morale—do our lads and lassies enjoy their work?—has always been high, generally speaking, in the gas industry. Our stability has offered our employees that security, the lack of which in other industries has caused so much of today's labor unrest, as so many of our industrialists are belatedly coming to recognize.

There is added security for every gas man and gal in our PAR plan, now in its fourth year. This page is primarily concerned with PA—Promotion and Advertising. But R—Research—can justifiably be included in these comments, since any industry with a powerful research program like ours offers a greater degree of job security still, because it is spending good money in thus protecting its future, and incidentally making its promotional problem easier to solve.

These days, you don't hear so much about service. Service with a smile! In the old days, the word "service" was overworked by us in our efforts to indoctrinate our employees to handle Mr. & Mrs. John Q. Public as they were entitled to be handled. As public servants, we preached "service" in our efforts to show them that civility and servility were not the same thing at all.

But now we have realized that the best employees are those who enjoy their work, who see opportunities for advancement, and who in an unsettled world feel secure in their employment.

The AGA research program, with its results to date, makes a fascinating story for every gas company employee to hear. The sales promotional angle alone makes it well worth the telling.

Earning Prosperity

DESPITE the suspicions aroused among members of the organized brotherhoods, and braving the indignant condemnation of the soap box economists, I still read and enjoy *The Wall Street Journal*. For my money, it makes good sense in its fighting efforts to defend our private enterprise against the inevitable asininities of bureaucratic bumbledom with its cockeyed controls and repressive regulations.

The Journal, of course, like all of us, has its naive moments, as was promptly pointed out by a reader, when in its Jan. 3 issue it stated: "A cutback in a Chicago appliance factory isn't just a Windy City worry. It warns that housewives anywhere from Bangor, Maine, to San Diego can't afford new refrigerators or have already bought them."

Let us quote from the comments of Walter S. J. Swanson, Bethesda, Md., in his letter to the editor:

> It may mean that, of course, but it also may mean no such thing. I dare say that many such cutbacks mean only that the salesman is going to have to get back on the job in the United States. The Bangor housewife quite probably hasn't been sold on the need or the advantages of a new refrigerator. Just because she's not volunteering to go downtown to fill out someone's order blank doesn't mean, per se, that she's broke. It could be that she's waiting to be sold, or that she is waiting for competition to bring a reduction in prices.
>
> It seems to be a commentary on our times that some businessmen (not all of them) are filled with alarm because at long last most products can be promised for immediate delivery, or because some prices may be reduced. One can only suspect, from their fears, that they have completely forgotten that up until the war almost everything, and that includes low-priced cars, could be had for immediate delivery, and at competitive prices. That situation didn't seem to keep the factories from running, nor did it keep many companies from making immense progress, both in expansion and earnings.
>
> The stock market already seems to have discounted not only a Truman regime, but almost everything else up to and including a major depression or war. Is it not, perhaps, time for it to start discounting a coming period when there may be no war; when the productivity factor again will operate to enlarge earnings; when the salesmen will go out and sell, and when our prosperity will be earned?

I am sure every sales executive in the gas industry whose memory goes back to the pioneer days when we really had to battle for automatic water heating and refrigeration load will endorse Mr. Swanson's position that the only normal way to earn prosperity is for salesmen to go out and create a demand for the services and products of our great industrial system.

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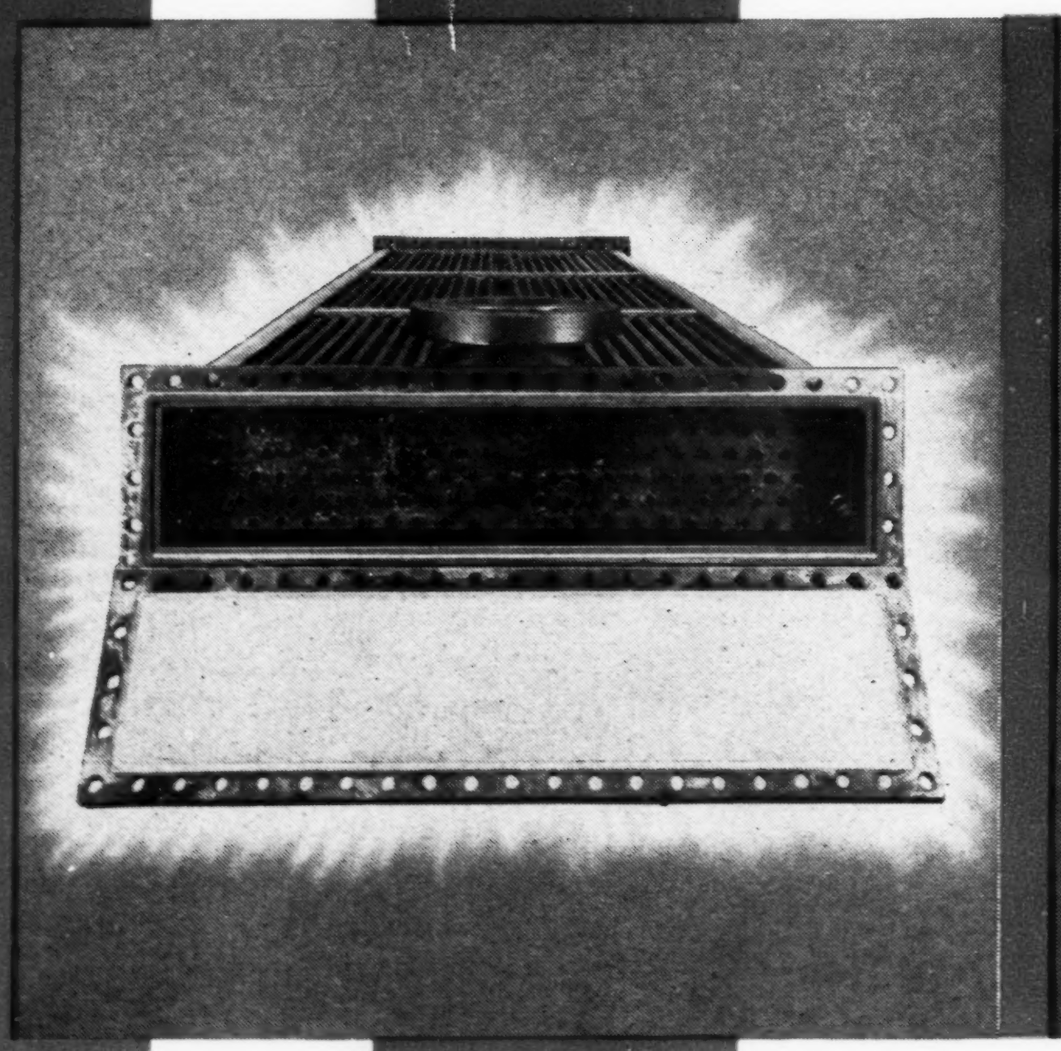

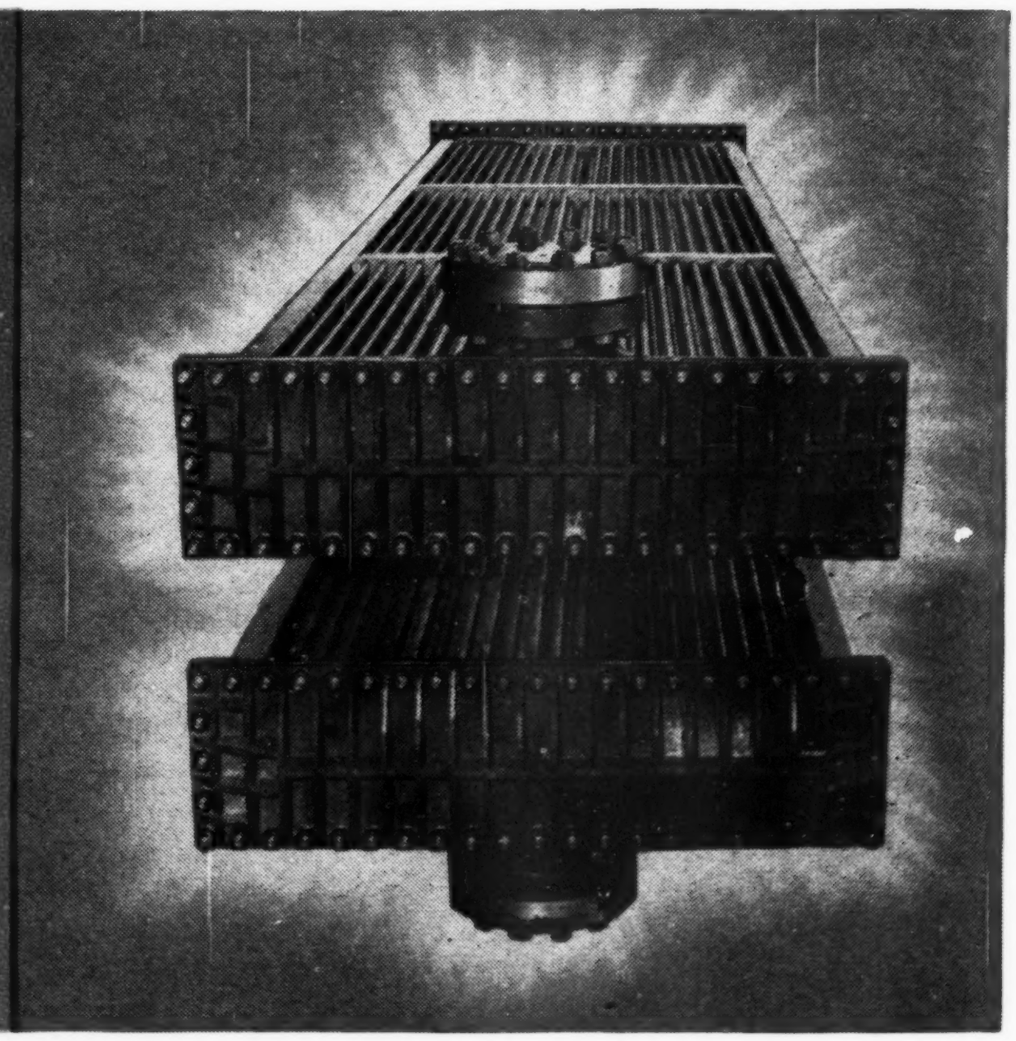

Typical of a large group of sections supplied to a Gulf Coast petro-chemical plant are these high pressure stainless steel sections. Headers are removable cover plate type of cast stainless steel with tongue and groove type confined gasket construction. Tubes are stainless steel.

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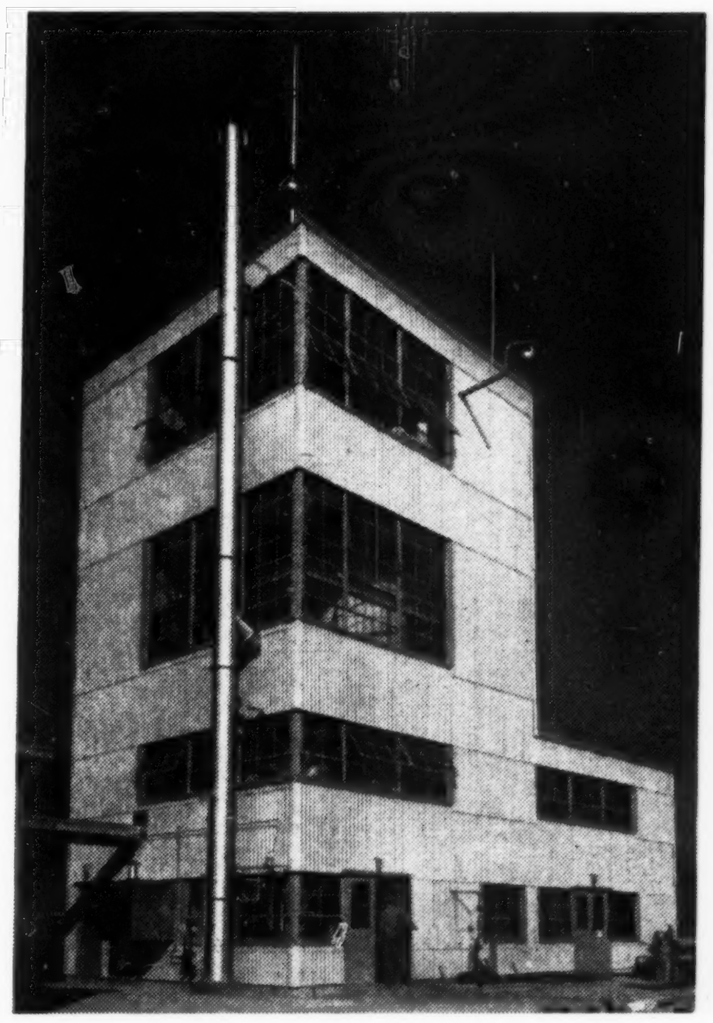
Continuous Carbonization and Gasification

Experiments Show Promise for Gas Industry

IN the towns of Library and Imperial, Pa., suburbs of Pittsburgh, pilot plant operations are in progress on some processes which may hold great promise for the gas industry. These are the processes of continuous carbonization and continuous gasification of coal, being investigated by the research and development division of the Pittsburgh Consolidation Coal Co., under the general direction of Joseph Pursglove Jr., vice president of Pittsburgh Consolidation. Dr. Howard S. Turner is director of the research and development division. Associated with him are E. H. Reichl, manager of research, and W. D. McElroy, manager of development.

Exclusive



Gasifying coal at the mine, this pilot plant went into operation Nov. 16 at Library, Pa., producing synthesis gas from fluidized coal.

Now Economical

Pilot plant work has progressed on the new carbonization process to the point where those in charge believe it may ultimately offer advantages over the existing United States practice for the production of gas of 400 to 800-Btu value, provided fuel markets are attractive for the char and the tar also produced.

Complete gasification of coal with steam and oxygen by a continuous process is being investigated in a separate pilot plant. The gas, of around 300-Btu value, may be upgraded to 1000-Btu, but this latter step is costly. At this stage, therefore, the development of these carbonization and gasification processes appears to be of potential importance principally to companies now using manufactured gas.

One feature that distinguishes what Pittsburgh Consolidation is doing on carbonization and gasification is that the work is directed to a continuous rather than a batch operation. All reactants are flowing continuously into the reaction zone. A large part of what is being done makes use of the principle of handling solids in a fluidized state, pioneered by the Standard Oil Development Co. in catalytic cracking of gas oil.

In connection with determining the value of these new processes to the gas industry, it is likely that the research staff of Pittsburgh Consolidation before long will be seeking answers to certain questions from utilities.

They will endeavor to learn how much various kinds of gas are worth at various periods of the year to different gas companies. They also would seek to learn the cost of underground storage in given circumstances and other steps taken to meet peak load problems.

In this connection, it is significant to utilities, who may be looking to coal carbonization or gasification processes for help in meeting peak loads, that any investment made by a coal company for the conversion of coal is going to be looked at most favorably to the extent that demand for the product will remain stable through the calendar year. If the quantity needed had its ups and downs, and if, say, a coal company owned the plant, then the peak load problem merely would be transferred from the utility to the coal company. The coal company would then simply be absorbing the erratic load factor on the investment rather than the utility.

If Pittsburgh Consolidation is successful in its experimental work and evolves a process requiring less investment than conventional gas-making equipment, it would be logical to use the new equipment for base load operation and the higher cost equipment for the peak loads.

This peak load problem is only one of the complex factors to be considered in determining whether it would be more economical to ship coal for processing at the site of the utility plant, or whether it would be better to effect the conversion at the mine and ship gas by pipeline to the utility.

Gas and Gasoline

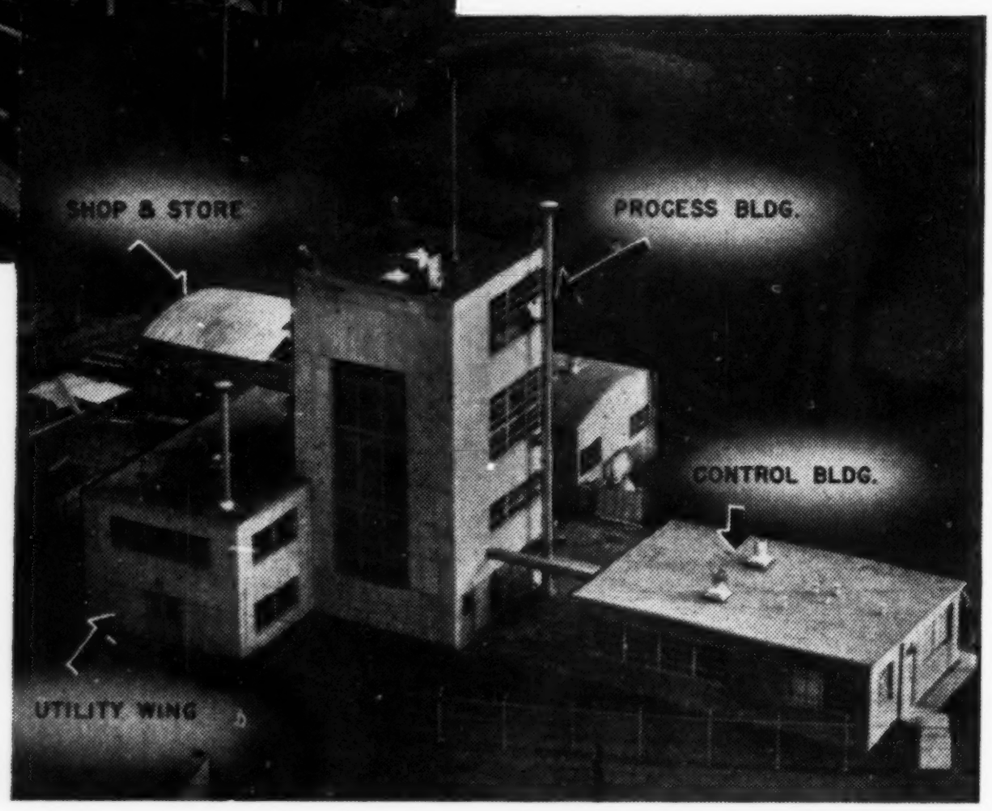
One possible solution that has occurred to many is a plant that will produce gasoline in the summer and gas in the winter. In this case, however, it appears that such a combination-purpose plant would require a greater investment for the return received for the production of gasoline than would be required if the plant were designed primarily for production of gasoline.

It is much too early to make an economic comparison of the Pittsburgh Consolidation carbonization and gasification processes as potential sources of gas for manufactured gas utilities. However, as the processes are now being conducted on a pilot plant scale, it is apparent that the volume of gas obtained per ton of coal processed by carbonization

Gasification

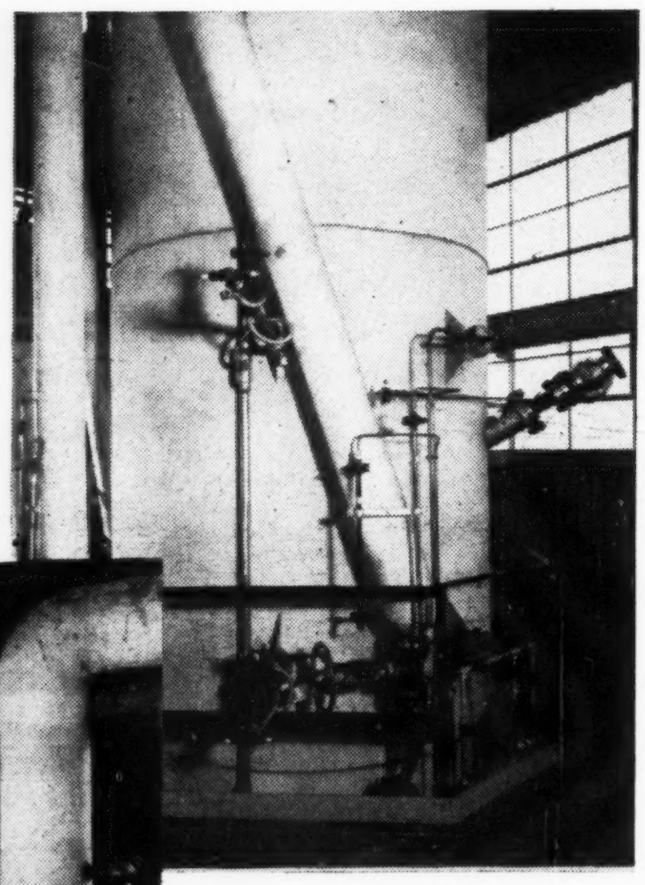
Extensive instrumentation assures safety and close control. Here staff member adjusts inert gas flow to instrumentation piping.

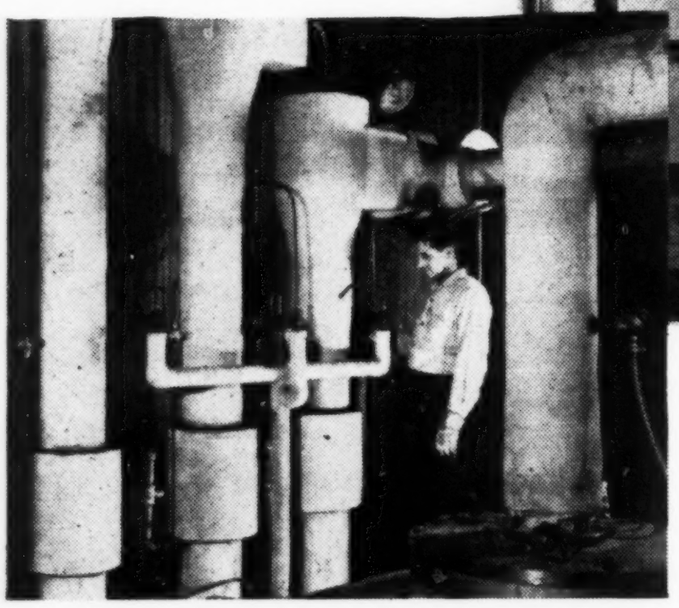
Aerial view of gasification plant, where fluidized coal is reacted with steam and oxygen at high temperature.



Middle section of the generator, top of which is shown below, located in the process building.

Five platform levels permit access to generator and auxiliary equipment. Staff member here is checking gas flow; at right is partial view of top of generator.





is but a small percentage of the amount of gas obtained in complete gasification. As is well known, the gas yield in carbonization can be increased by processing at higher temperatures, but even so, the yield per ton of coal processed is substantially less than obtained in complete gasification. The following figures on yield from carbonization as the temperature is increased from 800 to 1800°F, expressed per ton of Pittsburgh seam coal, are representative:

2500 to 13,000 cu ft of gas
27 to 13 gal of tar
.7 to .6 tons of char

Tar Markets Vital

Despite these relatively low gas yields, it is believed it would be possible to make gas by this process for a manufactured gas utility at a cost appreciably less than that of any present commercial process, provided satisfactory markets are open to the char and tar.

Several uses for the char are indicated. It may be burned under boilers: exploratory tests on this use are being conducted at Battelle Memorial Institute under the sponsorship of Pittsburgh Consolidation. The char can also be used in the production of smokeless fuel for domestic purposes, or as a feed material for complete gasification.

Isolating Components

Crude tar from coal carbonization is useful as a liquid fuel for certain applications, but its overall value can be materially increased by refining to specification fuels and by processing portions of the tar to marketable chemicals. The research problem is to learn what is in the tar produced under different conditions of carbonization, and then to devise means for isolating the valuable components.

Much progress has been made along the above lines with tar produced in conventional coke manufacture. But tar from lower temperature carbonization, such as in the Disco Process or the Pittsburgh Consolidation carbonization pilot plant, is a comparative newcomer. Up to now, the research work has shown presence of useful and valuable chemicals. Some are being isolated by a new process in another pilot plant near Imperial.

One of the important problems overcome in the development of this pilot plant process has been to devise a continuous process using a coal which becomes sticky at or below the temperature at which it is desired to run the process.

The work remaining to be done on carbonization concerns chiefly determination of the factors affected by the size and dimensions of the unit. In other words, the process appears economically feasible now, and the principal problem is to extrapolate equipment to a plant of commercial size. Ordinary seam coal has been used in the Pittsburgh Consolidation work. It is not necessary to use premium coal.

First of Its Kind

The new gasification pilot plant, which cost about $500,000 for design and construction, is the first large pilot plant erected in the United States for the continuous gasification of coal using the fluidized solids technique.

The plant now occupies an acre of ground, and there is space available for expansion. It includes a control building, the process building, and a combination shop and storeroom. The plant was designed and built in cooperation with the Standard Oil Development Co., by the Chemical Plants Division of Blaw-Knox Co. A staff of 50 people conducts operations on a continuous basis. Primary purpose of the gasification plant is to study operability of the process and equipment, to reach conclusions regarding costs and commercial designs. Some complex problems remain to be solved, and this may require modification of the present equipment.

Gasification Process

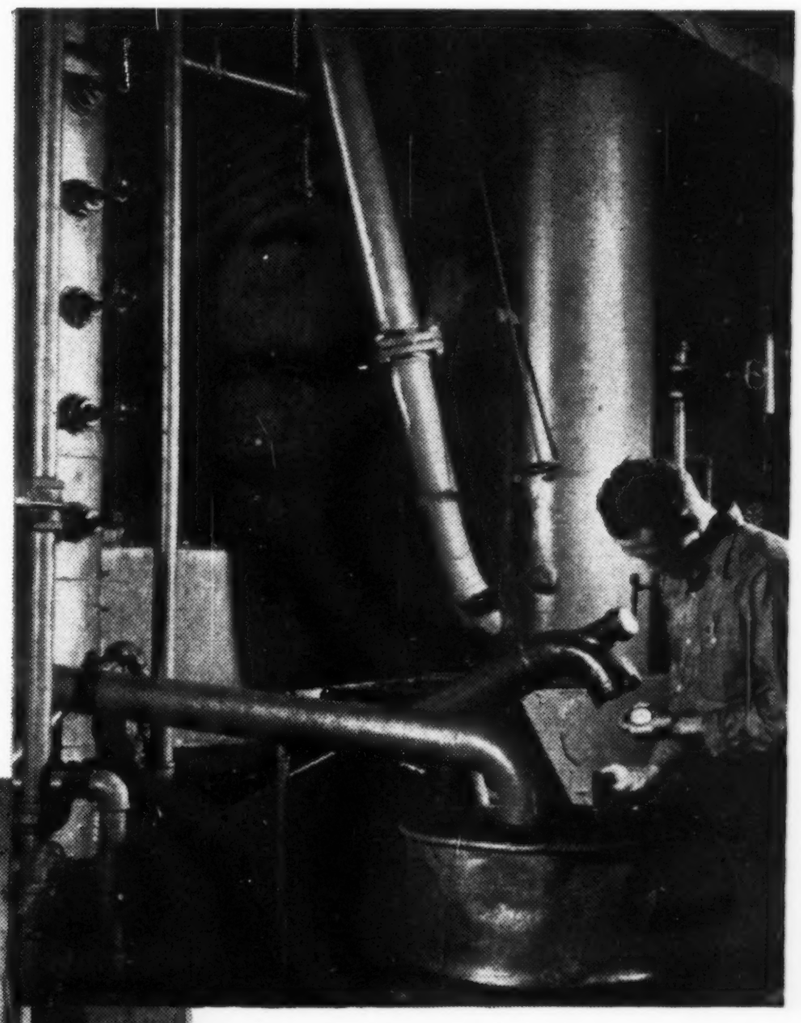
Gasification is accomplished by the reaction of steam and oxygen with the fluidized coal (or char) at a high temperature. The product is water gas, or in other words "synthesis gas." In addition to direct sale as low-Btu fuel, or for metallurgical purposes, or after enrichment as city gas, this gas also can be fed to a Fischer-Tropsch synthesis reactor for production of gasoline and chemicals.

The experiments are designed to learn what will be obtained from continuous gasification of Pittsburgh seam coal. The Germans successfully developed such a process for non-coking coal, but the problems were different.

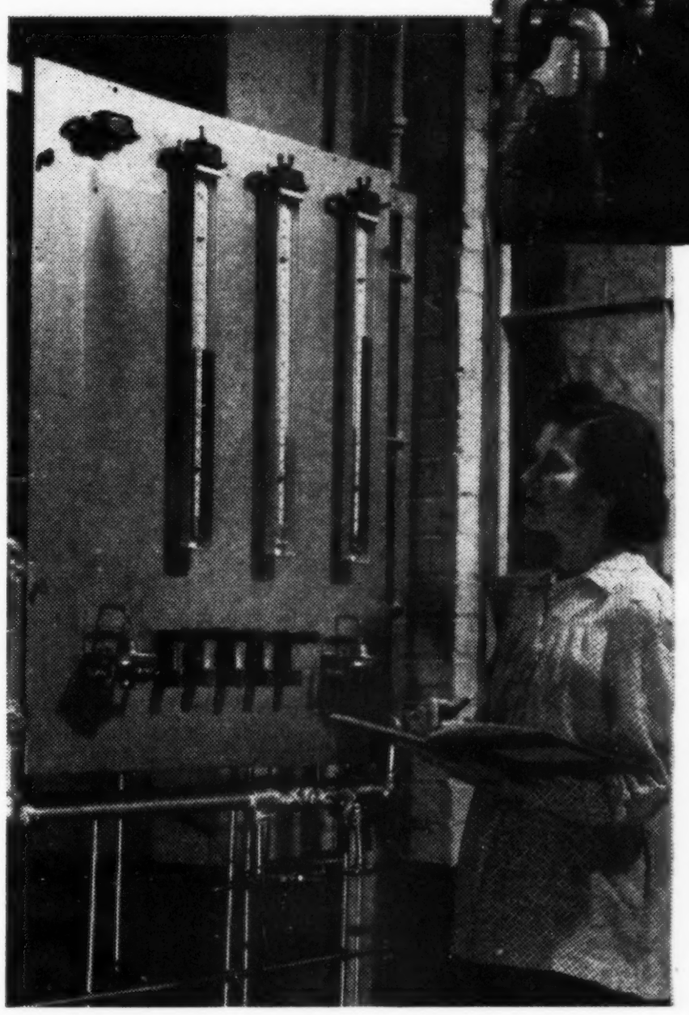
German continuous gasification and carbonization processes with non-coking coals included the Winkler, Lurgi, Pintsch-Hillebrand processes, and others. In this country, however, the low-rank coals which can be used for the German processes are not convenient to industry.

Many different ways of accomplishing the gasification with the coal available at Pittsburgh will be studied at the Library plant.

Carbonization

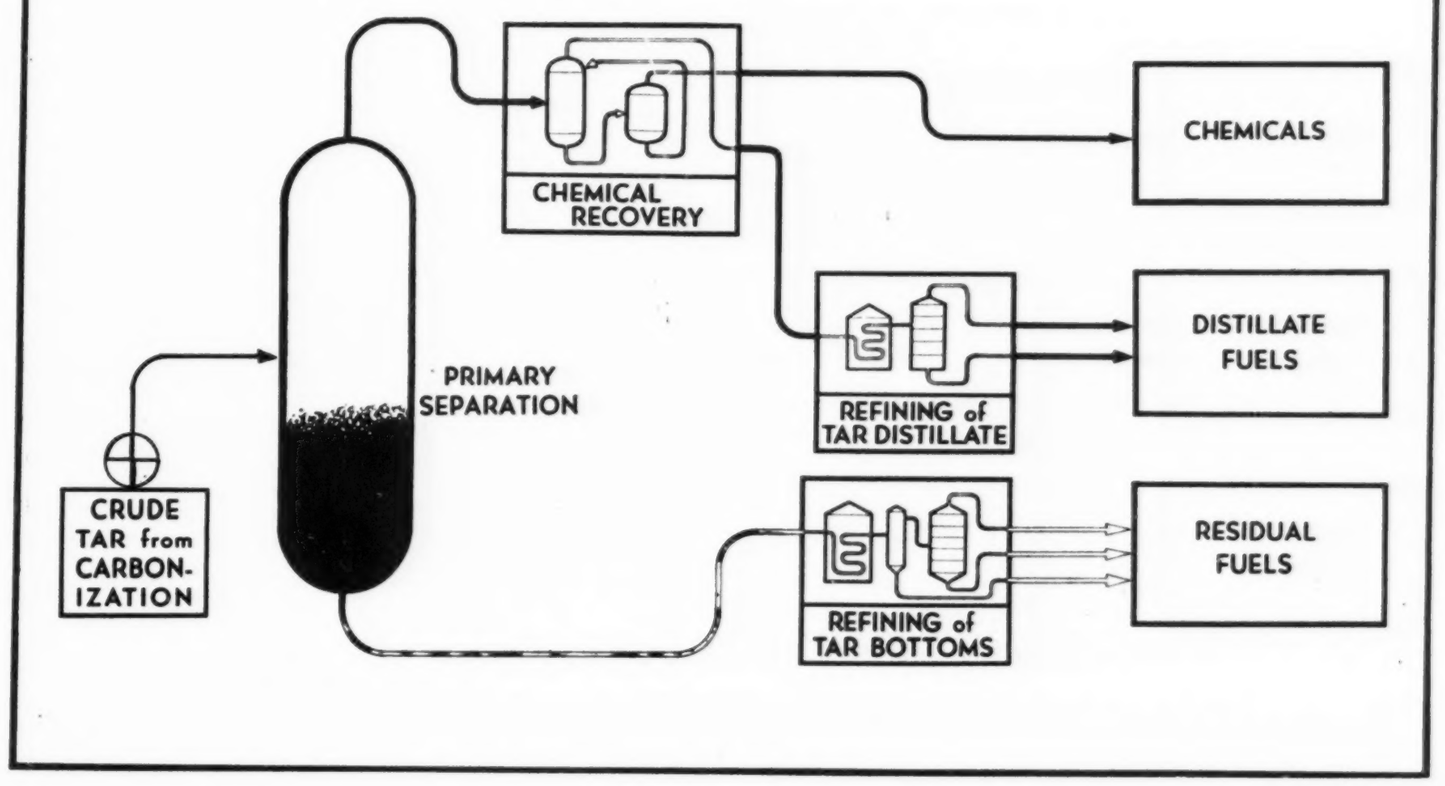


Making rapid determination of tar production rate from coal carbonization pilot plant. Such work helps determine the economics.

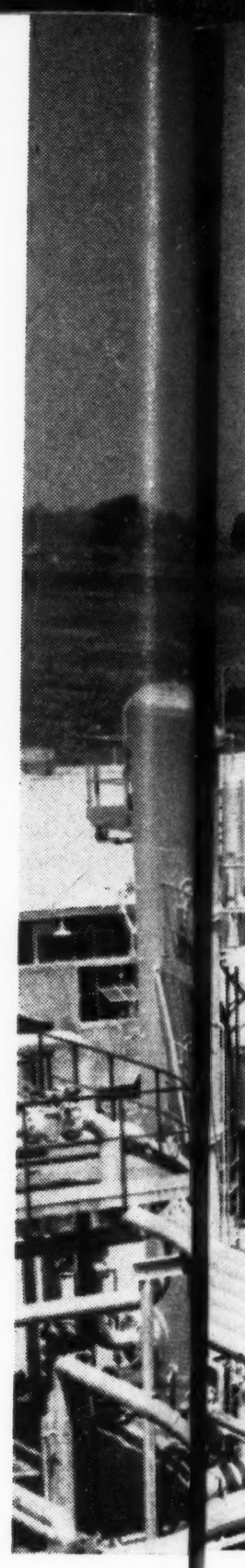


Measuring flow of gas for fluidized carbonization in the laboratory at Library. Here theoretical concepts are evaluated before being tried in large pilot plant located near Imperial.

Flow chart of tar refining, which increases its value by making specification fuels and marketable chemicals. Research determines components of tar, devises means of isolating those that prove to be of value.



UTILIZATION OF CARBON MONOXIDE EXTRACTED FROM NATURAL GAS IN THE PRODUCTION OF DRY ICE



By C. D. GARD

HISTORY OF GAS DEVELOPMENT IN THE FIELD

NATURAL gas produced in the Santa Maria oil field of California is in several respects unlike that produced in general in other California fields in that it has a relatively low 21.9 natural gasoline of 0.86 g/m, a low liquefied gas content, 0.75 g/m, is high in CO_2 with 16% average, relatively high in hydrogen sulphide content with 34 grains/100 cu ft average, and has a low heating value of 950-960 Btu range. All gas is produced at low pressures only. The field was initially developed in the early 1930's, but production on a large scale was not attained until 1938; later, during the period from 1938 to 1941, the productive area was rapidly extended, and since that time steady development has gradually extended the productive acreage to its present limits. The oil is of low gravity in the general range 12 to 16° API with some oil produced from wells having API gravity as low as 6.

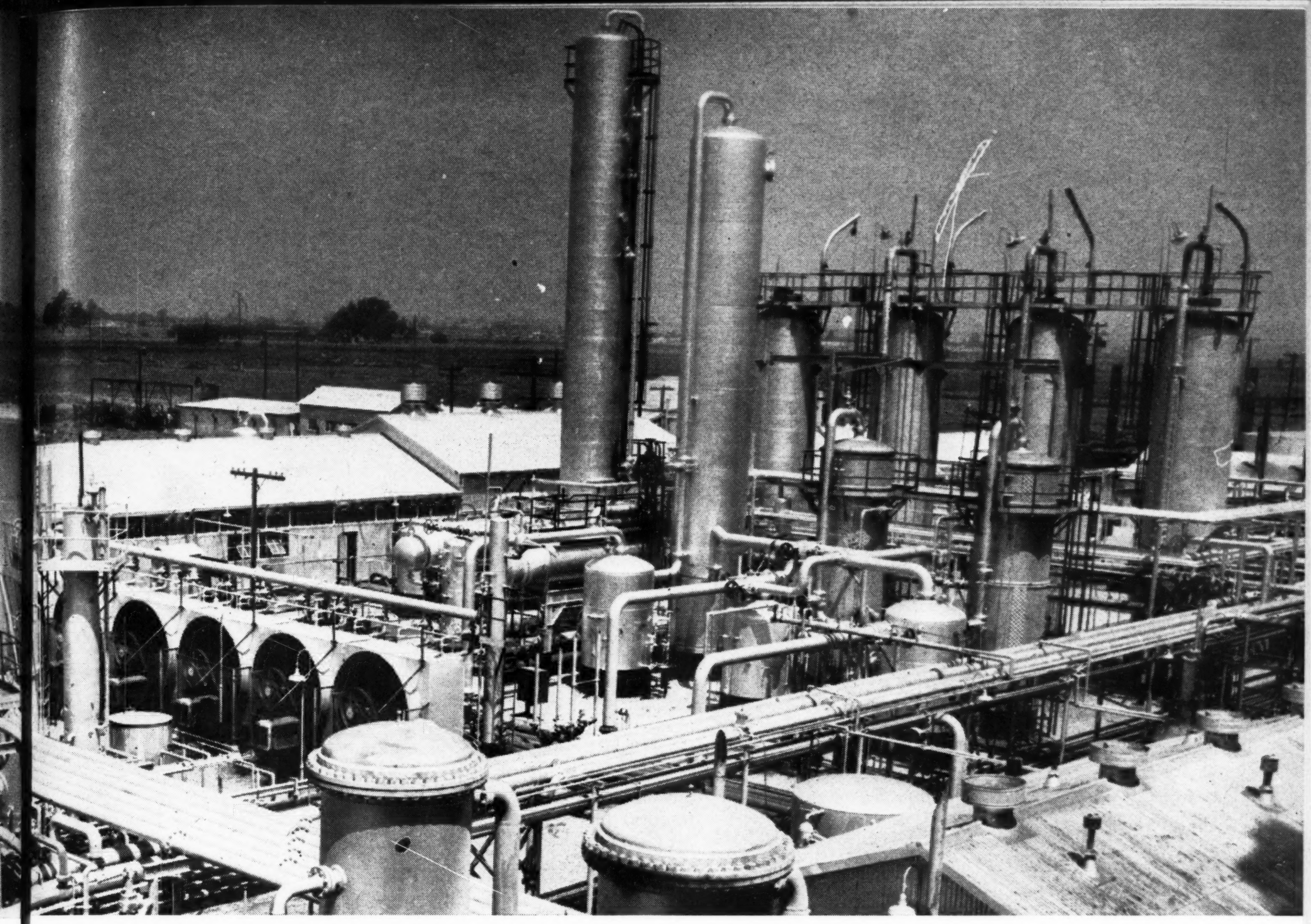
Because of the many adverse economic factors affecting the gas processing, this feature of the field development was slow, and it was not until after World War II began that conditions warranted the full development of a processing program. Prior to this time, the demand for low gravity, high sulphur, crude oil was such that the crude oil output was not substantial, and since the gas oil ratios were low, being of the order of 300, the total volume of gas did not justify the expense to gather and process the entire field gas output.

Natural Gas Processing

The processing program has been developed in about three successive stages as follows:

1. During the period prior to 1943, the gas from Union Oil leases only was compressed by one 150-hp unit to approximately 75 psig and delivered through pipeline to an existing plant, some seven miles south of the Santa Maria field, for processing. Here the gas was commingled with gas produced in this area (Orcutt field), the gasoline and some LP-Gas fractions removed, the residue gas purified of H_2S and delivered to the gas company for sale.
2. During the latter part of 1942, plans were made for the gathering of all wet, unconserved gas in the entire Santa Maria field and the processing of this gas in an absorption plant to be constructed at the location of the original compressor, other compressors being added to handle the new volumes of gas. The gas handling capacity of this plant was selected at 18,000 Mcf day, with the gas being compre from around 22 psig to 80 psig whe was contacted in two soda ash to for removal of a portion of the The H_2S at that time was about grains per 100 cu ft and the CO_2 tent only about 8-9%. The gas next compressed to approximately psig, partially cooled and contacte beds of dry iron oxide impregn wood shavings for the final remov H_2S. The gas was then cooled and tacted in two 200-psig oil absorber removal of natural gasoline and LP-Gas fractions. This plant was la built with equipment salvaged w available and, under the circumsta did not have the benefit of latest d in equipment. An additional com sor was installed later to increase capacity of the plant to around 2 Mcf per day.

With these facilities some gas wa livered directly to the Southern Cou Gas Co. for sale at around 200 psi local consumption, the balance b delivered to our Orcutt plant fo compression to 400 psig for sale t gas company; this latter gas was t ported to other localities for use. gas company during this period



The CO_2 plant and absorption plant area. Two columns in the center are the amine absorber (right) and the amine activator (left). The two short columns on the right of the absorber are soda ash-ferrox contactors and the four larger columns at the rear are dry oxide beds.

alled a glycol gas dehydration plant thin the Santa Maria absorption plant e and made several changes in its ansport system to accommodate the rger gas volumes.

uring the latter part of 1945, plans ere laid for the addition of other com-essors and a 450-psig absorber which ould further increase the volume of s handled. The work included the nversion of a portion of the former 0-psig residue gas system to 450 psig r delivery of gas direct to the gas mpany's transport system, this gas ing to areas south of the Santa Maria ld. Also, the installation of a new 0-psig residue gas system and changes the gas company's facilities for trans-rting increased volume of gas to areas rth of the field. Changes were also ade in the liquid fractionation cycle retain additional volumes of light uid fractions and the gas company stalled a 450-psig glycol gas dehydra-n plant. As the result of these anges, the plant processing capacity s increased to approximately 30 Mcf of gas per day. A little later, 300-hp injection compressor was in-lled in Cat Canyon, another oil field proximately eight miles to the south-st, to conserve a portion of the resi-e gas from the absorption plant.

PART 1

Extraction of Hydrogen Sulfide and Carbon Dioxide From Natural Gas

PRIOR to the last increase in plant capacity, the CO_2 content of the residue gas at Santa Maria field had been gradually increasing and had reached objectionable concentrations in the residue gas delivered to the gas company, and it soon became evident that with a new residue gas sales contract in the making, a more favorable price for the gas could be obtained by removal of sufficient CO_2 to assure delivery to the gas company of 1000-Btu gas. At the same time, the H_2S content had slowly increased from a former content of 12 grains per 100 cu ft to around 30 grains.

Two programs were initiated to improve these conditions. A CO_2 extraction plant was proposed and an investigation for development of a more effective means of removing greater quantities of H_2S in the primary or 80 psig plant was launched, as the operation of the dry oxide beds was becoming expensive. At the same time, with the increasing CO_2 content, the amount of H_2S removed by the soda ash contactors became less, the sodium carbonate being rapidly converted to bicarbonate by the CO_2.

The CO_2 Extraction Plant

The plans for building the extraction plant materialized in June, 1947, after

The author, who is process engineer for Union Oil Co. of California, Los Angeles, presented this paper before the Dec. 2 meeting of the California Natural Gasoline Assn.

various processes for CO_2 removal had been reviewed. The selection of the Girbotol system was made after consideration had been given to the possible manufacture of dry ice from the extracted CO_2, as it was believed that the minimum H_2S content of the extracted CO_2 resulting from the use of this process would be an advantage in dry ice making. The design of the process was made by the Girdler Corp. of Louisville, Ky., using monoethanolamine as the solvent, it being more favorable for the extraction of the CO_2 with minimum H_2S content.

The completed plant was placed in operation in May, 1948. The process employs a 20% solution of monoethanolamine with water. This solution is pumped over the top of a 20-tray absorber, 90 in. in diameter, with an overall height of 49 ft 9 in., having a design pressure of 127 psig. The design liquid rate is 280 gpm and the design gas throughput 30 MMcf per day at 80 psig. The enriched solution leaves the base of the absorber through a liquid level control valve, passing through a set of three exchangers, where it is heated by the hot lean solution from the reactivator. From there it passes to the 21st tray of a 23-tray reactivator, 72 in. in diameter and having an overall height of 59 ft 9 in., with design pressure of 94 psig and a design vapor capacity of 2100 Mcf per day of CO_2 and 6112 lb of steam per hour. The amount of CO_2 extracted at present is approximately 2300 Mcf per day. The hot amine solution in the reactivator is contacted by steam vapor generated in two reboilers operating in parallel. Absorber, exchangers, reactivator, and reboilers were all manufactured by the Southwestern Engineering Co.

Heating steam for reboilers is obtained from the turbine exhaust of steam driven pumps and fans. Exhaust steam from the absorption plant, formerly going to the atmosphere, was conserved to give additional heating steam. Any deficiency in heating steam is supplied directly from the main steam header operating in the range of 150-155 psig. The flow of steam to the reboilers is volume-controlled through a flow controller.

The reheated amine solution after passing through the reboilers is returned to the base of the reactivator and from there it goes to the exchangers, then to the Santa Fe Tank and Tower Co. Multifin coolers, where the temperature is reduced from 200°F to approximately 130°F. From the Multifin unit, the cooled solution goes to the final water-cooled closed coolers, where the temperature is reduced to approximately 100°F. The cooled lean solution then goes to the Byron Jackson centrifugal pump driven by 32-hp General Electric steam turbine, operating at 3550 rpm. The cooled lean solution from the pump returns to the 19th tray of the absorber, thus completing the cycle. A flow controller on the liquid line to the absorber controls the solution rate.

The CO_2 gas stripped from the rich amine, together with the steam generated in the reactivator, leaves the reactivator in two streams, one from the top of the reactivator, the other from the vapor space above tray No. 20. This feature was incorporated to provide a choice of selecting the CO_2 stream that would have the lowest H_2S content for processing in the dry ice plant, in case such a plant were to be constructed. Each of these streams is separately cooled and the water condensed by first passing through sections of the Multifin cooler. The final cooling of the two CO_2 gas streams is accomplished by closed shell and tube type coolers, the water being supplied by a Byron Jackson gas engine-driven circulating pump. The temperature on the overhead stream is cooled from 212°F to 85°F in the Multifin unit and to a final temperature of approximately 75°F in the final cooler. The side cut stream is similarly cooled from 220°F to 85°F, the final temperature being approximately 75°F.

Vapors and water condensate from the final vapor coolers then pass to two separate accumulators, where the gas is vented and the condensate collected and returned to the system by a common pump with two separate liquid dischargers. One of these liquid streams, about 2.5 gpm, is returned to the 23rd tray of the reactivator, the other stream being returned to the 20th tray of the absorber. The purpose of returning this condensate is to conserve any amine present and to reduce the carry-over of the amine in the overhead streams from the reactivator and the absorber. Control equipment was installed to vent the overhead stream and further process the side cut stream in any desired quantity or the mixing of the two streams and the processing of a portion of the mixture.

The Multifin units are of the horizontal type with four 12-ft Moore Co. fans each supplying approximately 128 Mcf per minute for cooling the hot lean amine, the reactivator overhead and side cut vapors. These fans are driven by 15-hp General Electric turbines, operating at 2200 rpm, through Western Gear Works speed reducing units, the fans operating at a normal speed of 328 rpm. The exhaust steam from the fan turbines and solution turbine at approximately 55-lb back pressure is used for heating steam in the two reboiler units as previously described. The steam condensate formed in the two reboilers is collected in an accumulator at approximately 50 psig from which it is returned to the boiler feed by means of a 12-in. x 7-in. x 16-in. Burnham Union steam pump.

In order to provide steam for the Girbotol plant, it was necessary to install additional boilers, the final selection being two Union Iron Works Type S boilers having a generating capacity of 21,000 lb of steam per hour. Boilers will operate at this rate normally, but each is capable of producing the maximum steam requirement should the other be down for repairs or cleaning. Gas is used for fuel and the flue gases are vented into a common stack, the main body of which is 48 in. in diameter with the top 130 ft above ground level.

The Redistillation Unit

A redistillation unit was installed to provide a means of removing residues formed in the amine solution. This unit employs a reboiler unit through which a small stream of approximately 1 gpm of amine is circulated for cleaning. Steam heat is supplied to the heating coils of the reboiler. The unit operates at atmospheric pressure and the overhead purified stream is returned to the circulating system. The principal impurities which form the residue are thiosulphuric acid formed by a reaction between H_2S and oxygen and soda ash entering the solution from the soda ash contactors. The residue accumulates on the heating coils of the reboiler, and in time the heat transfer is reduced to the point where it becomes necessary to shut off the amine stream and agitate the heavy residue mass and accumulation on the tubes with steam entering a distribution pipe at the bottom of the reboiler. This operation is repeated, draining and refilling with fresh water until the heavy residue has been removed.

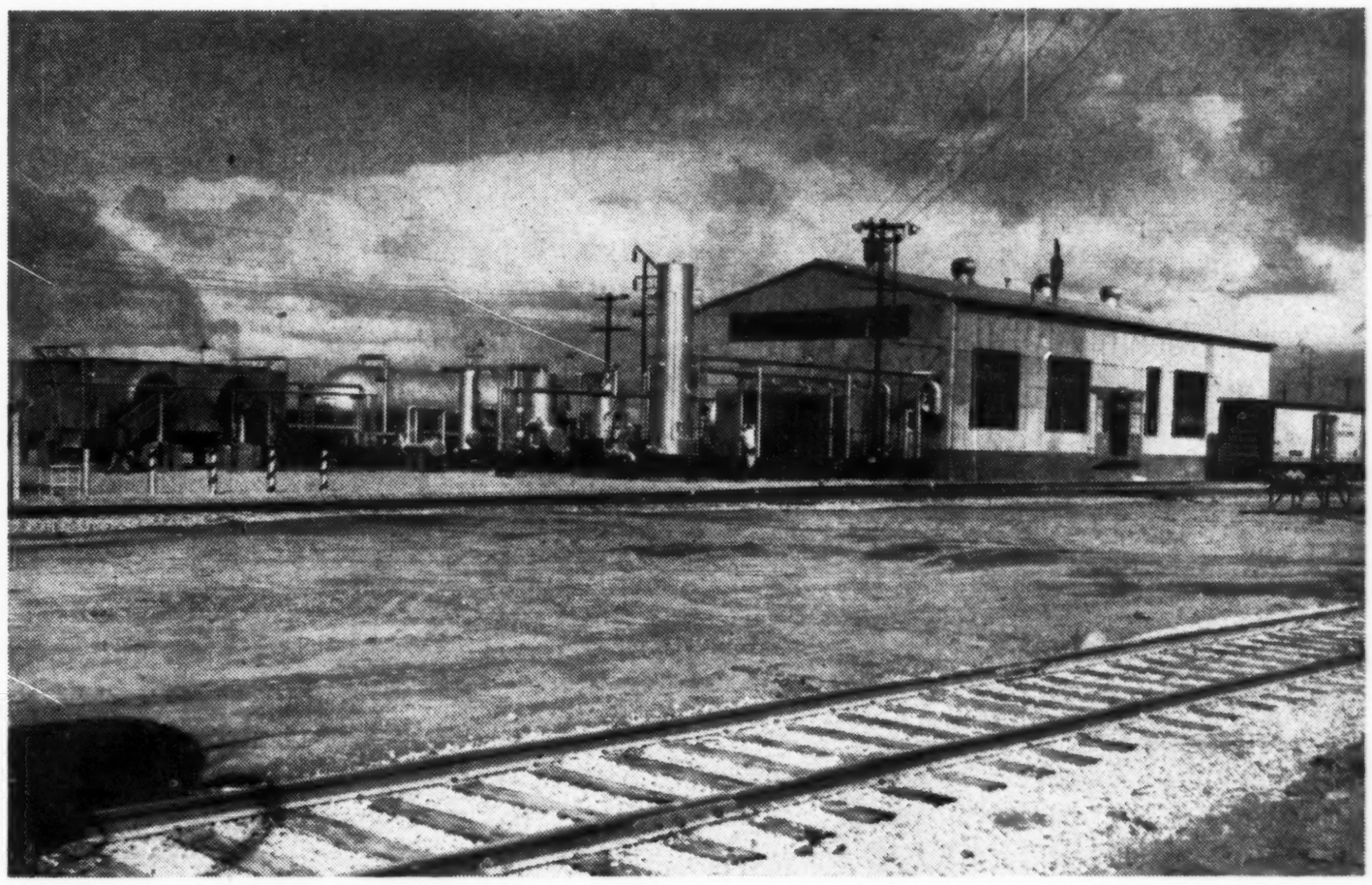
H_2S Extraction Plant

As previously mentioned, the original equipment installed at the plant for the removal of H_2S from the natural gas consisted of two contactors in which the natural gas was contacted by a soda ash solution, the solution being aerated in a small forced draft type cooling tower. After aeration, the solution was pumped from the basin of the tower to the contactors. To reduce the effects of H_2S on the process equipment, the incoming gas after being compressed from approximately 20 to 80 psig was contacted in the soda ash contactors and further compressed to around 200 lb, at which pressure the final purification of the gas was obtained by its passing through

beds of iron oxide-impregnated wood shavings before it went to the 200-lb absorbers for additional compression for that portion of the gas processed in the 500-lb absorber.

Of the various possibilities for improving the extraction in the soda ash towers, the idea of carrying finely divided iron oxide suspended in the soda ash solution seemed to offer possibilities. A trial operation was made using ferric chloride as a source for the iron. It was noted that the iron rapidly turned to iron sulphide, and the H_2S content of the exit gas was considerably reduced. Many difficulties with this process, however, were experienced, these being chiefly in the reconversion of the iron sulphide to iron oxide before it was returned to the contactors. A great deal of work was done along this line and the process that was eventually developed uses a soda ash solution in which is suspended the iron oxide. After passing through the contactors, the foul solution is vented in a separator to remove as much of the hydrocarbon gas as possible. It then passes through a series of long, horizontal troughs in which the foul solution is agitated with air, converting the iron sulphide to free sulphur which floats to the top of the liquid, and iron oxide which remains suspended in the solution. The free sulphur slurry is removed from the troughs by skimming and the reactivated solution is returned to the contactors to complete the cycle.

As a result of this development, the H_2S content of the gas is reduced from an average intake of 34 grains per 100 cu ft to an outlet of 3-4 grains. Ferric chloride is still used as the source of the iron oxide, and the overall H_2S removal operating cost has been considerably reduced. The sulphur in the slurry is in the pure form; however, associated with it is a high percentage of water with some soda ash and iron oxide. No process changes have been made in the operation of the dry oxide beds and their replacement cost has been materially lessened. As a means of deriving an income from the sulphur removed by this process, amounting to approximately 1100 lb per day, the H_2S slurry is presently being washed with waste water from the cooling tower system. This water is normally wasted to control the concentration of total dissolved solids for the purpose of lessening scale deposits on the cooling and condensing equipment of the absorption plant system. This washing is quite effective in increasing the sulphur content of the slurry, and it now appears likely that a market can be developed for the sulphur, either in slurry form or in dry powder, the drying being an operation not now programmed.



General view of the dry ice plant and railroad spur. On the extreme left is the CO_2 gas cooler and condenser. The large horizontal vessel to the right of the cooler is the CO_2 liquid storage. The smaller vessels are primary CO_2 liquid accumulator and flash drums. Dry ice press, storage bin and compressors are located within building, with the dry ice car to the extreme right.

PART 2

The Manufacture of Dry Ice

WHILE the engineering of the CO_2 extraction plant was in progress, a proposition was submitted to company management for the installation and construction of facilities for converting the extracted CO_2 into dry ice on the assumption that a definite market existed for increased dry ice production and that the anticipated revenue from the operation would be sufficient to retire the investment and show a profit in a reasonable time. The consumption of dry ice has rapidly increased in the past few years, the rate of increase being retarded by lack of ability, during the war years, to secure material and equipment for installation of new plants.

While the manufacture of dry ice is not a new industry, it may be interesting to review some of its sources and uses. Commercial carbon dioxide for the manufacture of dry ice is obtained from vent gases from boiler stacks, fermentation vats at industrial alcohol plants, chemical manufacturing plants, and natural wells producing carbon dioxide of relatively high purity. It is believed that the project at Santa Maria is the first plant to extract carbon dioxide commercially from natural oil well gas for the manufacture of dry ice.

Some of the interesting industrial uses are: in experimental low temperature rooms for the testing of airplanes and airplane equipment operations at low temperatures, for low temperature processing of aluminum rivets, for inflation of life preservers and life rafts, processing blood plasma, and preservation of meats, fruits, vegetables, and flowers in transit. The motion-picture industry has used dry ice in the production of several movies in which a dense fog or cloud scene was required.

Dry ice is a source of domestic and industrial cooling, having a temperature of minus 109°F with no residual waste product to present a disposal problem. It is generally chemically inactive in its contact with food products and has little or no effect on the moisture content of such foods. In its packaged form it is readily transported under atmospheric pressure in specially insulated containers. These characteristics suggest the possibility of a greatly expanded use. Individual handling of the packaged cakes presents no particular hazard, although caution must be exercised to prevent contact with the exposed parts of the human body. Such contact may cause severe skin injury similar to that received by contact with a high temperature substance. Carbon dioxide is non-poisoning but may produce suffocation. Carbon dioxide or dry ice, therefore, should never be confined to non-ventilated rooms in which people may be present.

It has been estimated that, commercially, liquid carbon dioxide and dry ice are used in the following percentages:

As carbon dioxide gas for carbonating and industrial uses	26%
Dry ice for foods, including transportation of meats	20%
Dry ice for ice cream and dairy products	40%
Dry ice for industrial users	14%

Considerable time was spent by our engineering staff in reviewing the operations of existing plants as well as theoretical considerations, at the close of which it was decided to employ the Girdler Corp. to furnish the necessary engineering design and purchase of equipment for installation of a plant for the manufacture of dry ice, this plant to be located adjacent to the gas and oil treating facilities on the Battles lease.

The process of making dry ice as practiced at the Santa Maria plant involves the purification of that portion of the CO_2 stream vented from the reactivator overhead or side cut condenser which is to be processed for the manufacture of dry ice. There exists in the total CO_2 stream now being removed from the natural gas stream approximately 130 tons of CO_2 per day. The maximum volume of CO_2 gas processed in the dry ice plant is anticipated to be approximately one-half this volume, the plant having a design rated capacity of 56 tons per day. After the process cycle used by some existing dry ice plants was reviewed and the problem was discussed in detail with the Girdler Corp., that company was selected to design the plant and purchase the materials.

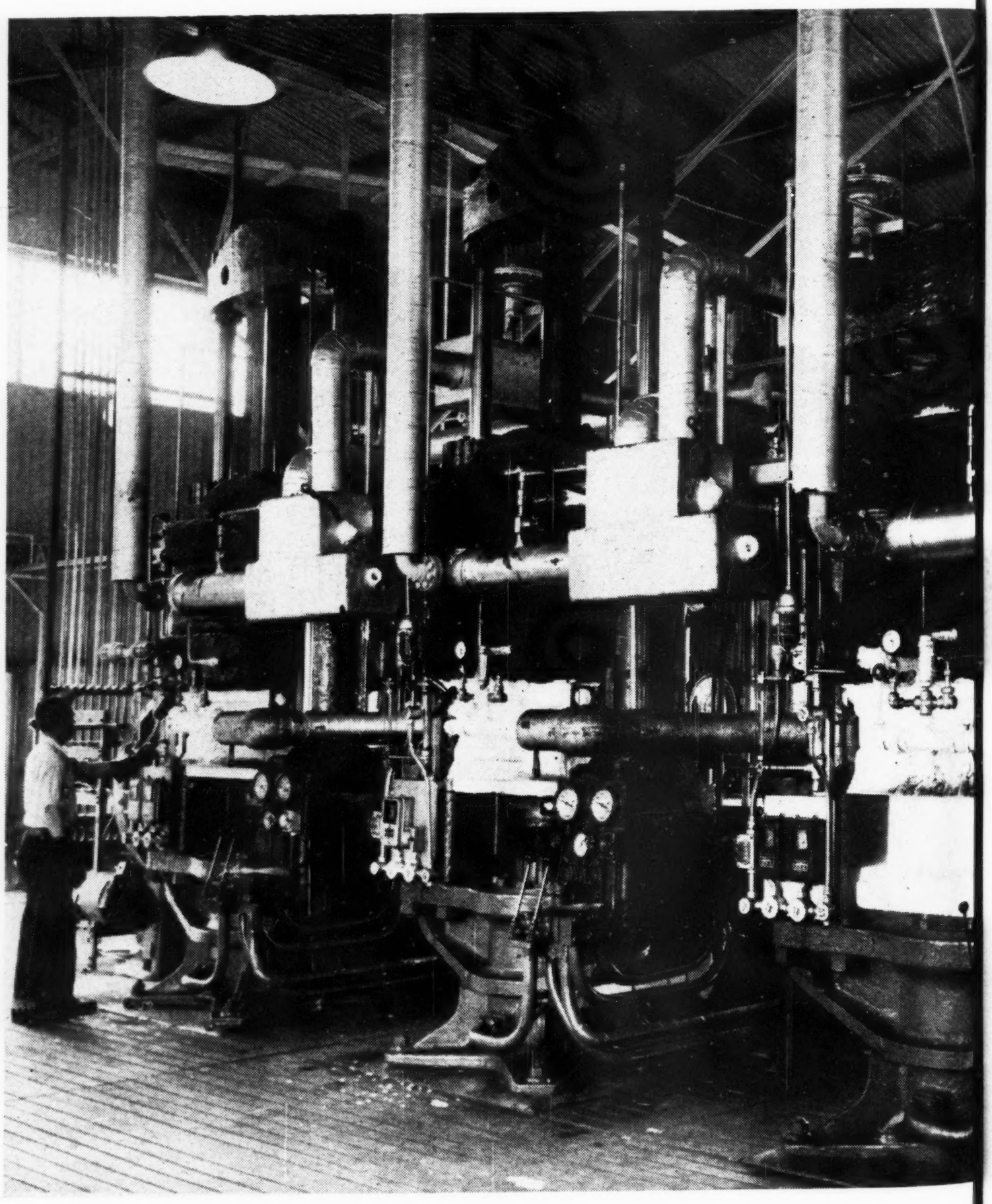
The ultimate design deviated from the practice of using supplemental refrigeration for obtaining low temperature CO_2 liquid. The CO_2 gas from the final condensers at the extraction plant is under approximately 20 psig and, therefore, the total horsepower required to compress the CO_2 gas from this pressure to 1000 to 1100 psig, where cooling to atmospheric temperatures would give CO_2 liquid, is not as great as if the pressure of this gas had been near atmospheric, as is often otherwise the case. An engineering study of the problem indicated that it would be to our advantage to obtain the necessary low temperature CO_2 liquid by stage venting and recycling the vented vapors rather than applying mechanical refrigeration for this purpose.

Purification of the CO_2

In the selected process, the 20-lb gas from the extraction plant is passed through two 48-in. double contact purification columns operating in series. The CO_2 gas stream enters the lower portion of the first of these two columns, where it is contacted with a portion of the ferric oxide-soda ash solution used in our primary H_2S extraction plant. This contacting removes practically all of the H_2S in the CO_2 stream. The original design provided for contacting the gas in the upper portion of this first column with a solution of borax and potassium chromate. However, a short period of operation indicated that the solution was used up at such a rapid rate that the cost would be unreasonable; it is our plan to circulate our ferric oxide solution in the upper half, replacing the chromate solution, because the ferric oxide solution can be reactivated and no means were provided for reactivating the chromate solution. The CO_2 stream passes from the first column into the lower portion of the second column where it is contacted with potassium permanganate solution. The upper portion of the column also contacts the gas with permanganate solution. The spent solution from the lower portion is discarded and replaced by the partially spent solution from the upper portion. The upper portion is then recharged with fresh solution. The first column removes all of the H_2S and the second column will remove any traces of H_2S that might pass through as well as traces of amine which might give the ice an objectionable odor. The liquids are circulated through the columns at the rate of 30 gpm, each liquid stream being separately pumped.

CO_2 Compression and Liquefaction

From the outlet of the second column the purified CO_2 stream is delivered to the intake of the compressors



View of the dry ice presses from the operating side. The press at left is being filled with liquid, press in center is "snowing," and the press at right has just ejected a dry ice cake from press chamber.

at the dry ice plant. Here the gas is compressed to 140 psig, cooled, and then goes to the second stage compressors, where the pressure is raised to 520 psig, then cooled, dehydrated, and further compressed to sufficient pressure to cause liquefaction to occur at the temperature of this stream leaving the final cooler. A maximum condition of 1100 psig and 85°F was anticipated.

CO_2 Dehydration

To avoid difficulty of freezing in the colder streams of CO_2 liquid and vapor, it became necessary to dehydrate the CO_2 gas stream prior to the liquid stage. This was accomplished by installation of a Pritchard "Hydryer" unit on the suction to the final stage of compression of CO_2. The gas dryer consists of two units which may be alternately placed in operation by means of a manifold. Each unit is filled with 1200 lb of activated alumina and is capable of removing 7 lb of water per hour from 12,000 lb per hour of CO_2 gas with a final dew point of —40°F. The design pressure of the unit is 650 psig. The operating cycle is eight hours. The beds are reactivated by blowing air, heated by a steam heater, through the saturated bed and venting to atmosphere. The air is heated to about 320°F, and air from the Hydryer has an initial temperature of approximately 40°, gradually increasing as the temperature of the bed increases, reaching a maximum of approximately 250°. After five hours of heating, the steam is turned off from the air heater and the cooled air is permitted to flow through the vessel for approximately two hours. The vessel remains idle for approximately one hour and is then ready for placing on the line. The temperature of the dried CO_2 stream leaving the bed is in the range of 60 to 70°. The beds are continuously alternated.

CO_2 Cooler and Condenser

It was realized that for short periods each year temperatures normally obtained by the conventional cooling tower method might be above the critical, in which case, no condensation would appear. The type of cooling tower selected, therefore, was an evaporative cooler. The unit selected was Industrial Engineers' in which two fans are separately driven by gas engines. These engines also drive separate water circulating pumps. The fans are 5 ft in diameter, operating at 550 rpm. The pumps are Byron Jackson "rain" type, with a normal rating of 700 gpm at 1348 rpm and 60-ft head. The fan drive is accomplished by V-belt; the pumps are direct connected to the engine.

TABLE 1. CO_2 GAS TO COMPRESSORS

	1st Stage		2nd Stage		3rd Stage	
	Lbs./Hr.	*% of Total*	*Lbs./Hr.*	*% of Total*	*Lbs./Hr.*	*% of Total*
Make-up Stream from Extraction Plant	5480	60.89	5480	45.31	5480	24.94
CO_2 Gas from Ice Presses via Surge Tank	3520*	39.11	3520*	29.10	3520*	16.02
CO_2 Gas Vent from Liquid CO_2 Storage Tank			1985	16.41	1985	9.03
Gas Vent from 150-lb W.P. Flash Drum			1110	9.18	1110	5.05
CO_2 Gas Vent from 510-lb W.P. Final Accumulator					9880	44.96
TOTAL	9000	100.	12,095	100.	21,975	100.

Horsepower Per Day/Ton Dry Ice Per Day $= \frac{600}{56} = 10.7$

* Same Gas.

TABLE 2. CO_2 TO AND FROM DRY ICE PRESSES

	Lbs./Hr.	*% of Total*
Dry Ice from Presses	4,660	51.78
Vent Loss to Atmosphere Unaccounted Loss	820	9.11
Blowback from Presses to Compressors	3,520	39.11
	9,000	100.

Liquid Expansion

Liquid from the high pressure accumulator is float-controlled into a 3-ft x 8-ft vertical vent tank operating at 510 psig. Vapor is vented from the top of the separator and returns to the suction of the final stage compressor. The liquid leaves this separator at 35°F and enters a second separator at 235 psig. The vent vapor returns to suction of the second stage compression. This separator is 104 in. in diameter and 33 ft in length, mounted in a horizontal position, and serves as CO_2 liquid storage, the temperature being —10°F. From the storage vessel the liquid CO_2 is float-controlled into the 3-ft by 8-ft vertical final flash drum which is constructed of stainless steel, having a normal working pressure of 165 psig. Flash vapors from this vessel return to the suction of the second stage compression, and the liquid at —40°F is piped to the dry ice presses.

Compressors

The CO_2 gas received from the extraction plant and recycled from the dry ice plant is handled by two Clark MA-8 compressors. The final design of the plant was adjusted to a dry ice output based on 100% utilization of the available horsepower; that is, 600 hp. The jacket-water of these compressors is cooled by three Industrial Engineers' radiator units having a total water circulation of 600 gpm. The CO_2 gas handled in the compressors is shown in *Table 1*.

Dry Ice Press

These presses are three in number, 250-ton Baldwin Southwarks, each capable of making 18 to 20 tons of dry ice per day. These presses are individually operated by electric motor-driven hydraulic pumps, there being two hydraulic systems, one of which raises and lowers the platen, the other raising and lowering the compressor plunger and boosting the pressure being applied to the plunger during the compression of the dry ice cake in the pressure range of 2200 to 2500 psig. During the operation of the press, liquid initially enters where flashing occurs and the flash vapor is vented from the press chamber at approximately 80 psig, which is just above the triple point.

After the press chamber has been filled with the required amount of CO_2 liquid, the liquid feed is shut off and flashing continues. This requires approximately two minutes. This venting continues for another minute, during which the vent control valve is opened

wide and the pressure in the press chamber decreases to around 40 psig. During these two periods, the gas vented from the press goes directly to the interchanger on the liquid stream between the high stage liquid CO_2 accumulator and the first stage flash drum. Here the temperature of the vented gas is raised from —80°F to 0°F; the gas then goes to the CO_2 vapor surge drum. The gas from this chamber goes to the suction of the first stage compressor. A flow controller is used to prevent the full surge of the vent volume from entering the compressor.

At the close of this second period, venting continues through a second valve for one and one-half minutes directly to the suction of the first stage compressor until the pressure in the press chamber is approximately 20 psig. The remaining vapor in the chamber is then manually vented to the air.

At this time the CO_2 in the press chamber is in the form of a snow and is ready to be compressed into the cake. This is accomplished by lowering the compression plunger and applying hydraulic pressure of 2200 to 2500 lb on the plunger. This compresses the snow into a cake having the approximate dimensions of 20 in. x 20 in. x 10 in. and weighing approximately 240 lb. The cake is now ready to be ejected from the press chamber. This is accomplished by lowering the platen, the cake following the platen out of the press chamber. When the platen reaches its lower position the dry ice cake is manually pushed onto a power-driven roller conveyor. The platen is then raised, the plunger returned to its normal position, and the operation repeated. The total elapsed time is about seven minutes. The CO_2 gas vented from the presses as well as the quantity of dry ice is shown in *Table 2*.

Sawing and Wrapping

After leaving the press, the dry ice cake travels to a band saw where the cake is cut vertically into two equal portions; the two halves then continue to the end of the conveyor, where an automatically controlled device pushes the two portions onto another conveyor at right angles. Here it passes through another band saw, where the cake is cut at right angles to the first cut, making four cakes of equal size with approximate dimensions of 10 in. x 10 in. x 10 in. These cakes then proceed on the conveyor to the wrapping table where they are wrapped in a heavy manila bag, tape-sealed, and weighed on an automatic scale. The wrapped cake then is placed on another power driven conveyor for direct loading into the dry ice cars.

Car Loading

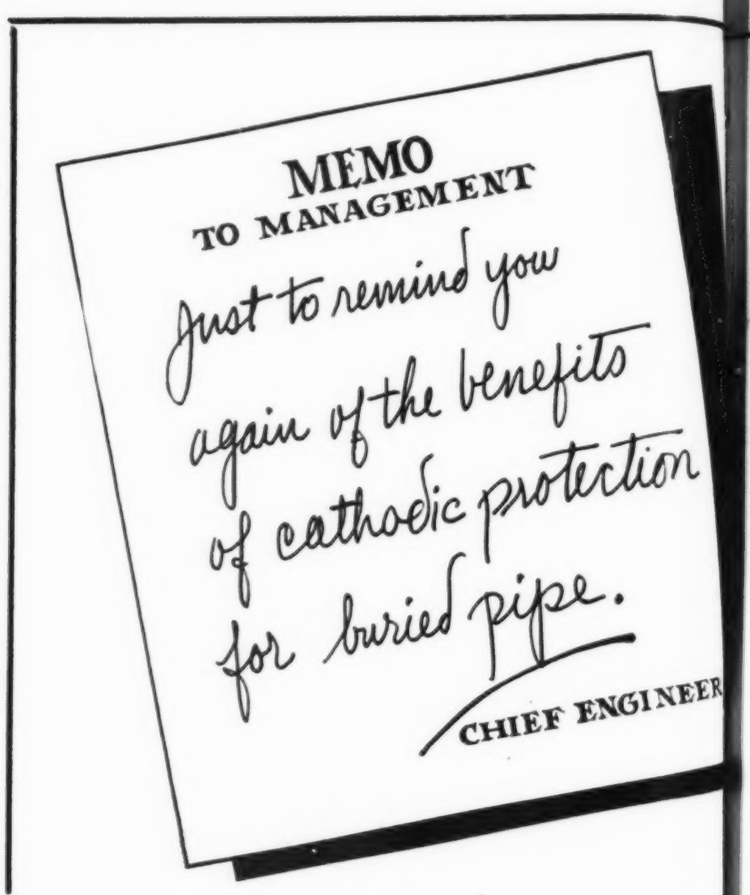
In order to dispose of the dry ice product, the company laid spur track of approximately two miles in length from the Santa Maria Valley Railroad tracks from a position north of the plant and extending into the dry ice plant site adjacent to the building. A spur track also was installed at the same time to provide rail shipments of petroleum products processed in the Santa Maria valley absorption plant.

Specially constructed dry ice cars are spotted at the loading site by the Santa Maria Valley Railroad. These cars are heavily insulated and are somewhat similar to the standard refrigerator car. Dry ice in the packaged form is loaded into the cars, being placed 7 blocks wide, 33 blocks long, and 5 blocks high, with a total of 1155 cakes per car. These cakes must be positioned to avoid any movement during shipment, as such movement has a tendency to fracture the cakes. Any space remaining between the rows of dry ice and the car body is filled with sawed slabs of dry ice cut from regular 10-in. x 10-in. x 10-in. cakes. Additional slabs are placed on top of the top row of cakes, all of these being unwrapped. In addition to filling the spaces, the slabs provide a quick chilling of the car, thus reducing the loss from the wrapped cakes during transit. Specially built dry ice blankets are placed on top of the loaded ice to reduce further the loss during shipment. The net loaded weight of these cars is approximately 69,000 lb.

Dry Ice Storage

A dry ice storage bin has been provided adjacent to the scale for the storage of dry ice manufactured during the period no cars are immediately available. This bin is approximately 30 ft long, 10 ft wide, and 5 ft deep, projecting approximately 3 ft above the floor line. The outer walls and the bottom of this bin are insulated with 12 in. of insulation. Two vertical partitions which divide the bin into three equal sections are 10 in. thick, 8 in. of which is insulation. The entire bin is sealed with wood and heavy tar paper and then covered with heavy galvanized iron. When in use the dry ice cakes are brought into position for unloading into the bin by being placed on the belt conveyor. This belt conveyor can be reversed for unloading the bin. After the storage has been filled, the dry ice blankets are placed on top of the ice to reduce its evaporation loss.

A truck loading dock has been provided, but to date no shipments by truck have been made. Increased demand later may make this necessary.



This "Memo to Management" is the first bulletin prepared by the new Correlating Committee on Cathodic Protection, whose membership is drawn from 11 nationwide organizations including the AGA, API, National Association of Corrosion Engineers, and others.

To quote Mr. H. H. Anderson, Chairman of the Topical Committee on Pipe Line Technology, "The bulletin is written in laymen's language and aimed especially to inform management about this technique which can curb a staggering economic loss to industry."

CORROSION of buried plant and its contingent losses are costing American industry about a billion dollars per year. Much of this loss can be stopped by proper preventive measures.

These enormous losses and the problems of preventing them are shared in different form and degree by all operators of water, gas, and oil lines, communications, signal and power cables, rail tracks, tanks, equipment foundations and other metallic structures buried or in contact with the soil or water.

Corrosion of buried structures is simply a chemical attack by nature which attempts to revert refined metals to their original form as ores or compounds. This chemical attack always goes hand-in-hand with a flow of electric current from the metal. In most cases a chemical attack causes the current flow but, conversely, a flow of impressed current from metal into soil causes chemical attack. If such current out-flow can be prevented, corrosion cannot occur.

Regardless of whether the attack initiates the current flow or vice versa, the corrosion damage is physically

similar; a current out-flow of one ampere in one year accompanies a loss of as much as 20 lb of iron or steel, or 70 lb of lead.

Corrosion prevention properly starts with the design of structures and equipment, including the selection and placement of materials—in particular avoiding the contact of dissimilar metals—so as to minimize corrosion possibilities. During plant construction and subsequent operation, much corrosion can be prevented by avoiding the disposal of waste matter where it may unnecessarily pollute the soil in or near the plant. In concentrated operating areas, effective surface drainage will minimize the likelihood of soil pollution.

The attention of industry was directed, even before 1900, to the corrosion of buried pipe and cable near electrified street-railway tracks by the currents which "strayed" into these structures from the rails. The pipes and cables were corroded where these currents left them via the soil enroute back to the current source. This type of corrosion is called "electrolysis."

Joint engineering committees in many metropolitan areas, through a fine spirit of cooperation, have effectively minimized the damage due to stray-current electrolysis. The customary technique is to keep the stray currents as low as possible, and to provide continuous metallic paths through which they will flow back to their source.

Though not initially recognized as beneficial, these currents, when strong enough, stopped corrosion where they strayed into the other structures because they prevented the out-flow of the weaker currents attending such corrosion. This electrical counteraction is the basis of the rapidly developing technique of cathodic protection.

In numerous areas where transit companies have abandoned electrified track, operators of other structures are finding that the removal of the stray railway currents has allowed the weaker currents of natural corrosion to flow unopposed. The cathodic protection before provided in various degrees by the stray currents has been removed!

Outside of the geographically small metropolitan areas, different problems are presented. Corrosion of buried structures is widespread unless it is prevented. Among the accepted preventive techniques are properly engineered coatings or cathodic protection, or a combination of the two.

If a structure could be coated with an impervious and durable layer of electric insulating material, all flow of current to or from the soil would be prevented. Inasmuch as the soil and moisture would be separated from the structure, corrosion could not occur.

Although excellent coatings now are available that will provide reasonable protection if carefully applied, most of them will deteriorate or become damaged in time. Such coating defects tend to focus corrosive action and hasten structure damage locally.

Early structures were buried bare, and many coatings applied on other structures prior to the last decade have little if any protective value now. To coat or recoat these operating structures—which usually requires that they be uncovered, raised and cleaned—is difficult and expensive, and often impractical.

For reducing corrosion on older structures, or insuring continued protection with newer coatings, the use of cathodic protection is indicated. Specifically, this is the technique of impressing inward-flowing currents to counteract, and thus prevent, the outward-flowing currents of natural corrosion. Where cathodic protection is applicable, it has the special advantage that it can be installed with very little disturbance of the structures.

To apply cathodic protection requires continuous supplies of protective current. It requires also, to be buried in suitable ground-beds at appropriate distance from the structure, one or more anodes through which this current can be introduced into the soil. For this current to serve its purpose as it fans out through the soil and distributes itself along the structure, it must be of sufficient strength or density to enter the structure and counteract the harmful corrosion currents.

Two types of protective current source may be used. Where considerable current is required, it may be obtained from direct-current generators or rectifiers connected by insulated wires positively to the anodes and negatively to the structure. For the introduction of external currents through the soil into the structure, anodes of graphite rod, or of scrap cast-iron or steel are customarily used.

Where less protective current will suffice, anodes can be used which will self-generate the needed current. When masses of magnesium, aluminum or zinc are buried and connected to a steel or lead structure by insulated wires, they will generate current (as in a battery) which will flow through the soil into the structure.

All types of anodes will be corroded by the protective current which they discharge to the soil, and they must be renewed at intervals. However, under favorable conditions these anodes may last several years before replacement is necessary.

Some of the current introduced at the anodes to cathodically protect one structure may enter a neighboring structure and traverse it for a distance while enroute to the protected one. Where this current leaves the neighboring structure and enters the soil, corrosion occurs which is similar to street-railway stray-current electrolysis. It can be prevented in several ways, one of the commonest of which is to connect the neighboring structure to the protected one by a wire "drainage bond" of proper resistance.

Because of this possibility of interaction, any operator planning a cathodic protection installation should notify operators of neighboring buried structures so that all concerned can appraise the interaction problems. Experience shows that these can be dealt with most effectively and satisfactorily through cooperative study and tests by the engineers of the operators involved.

The foregoing paragraph applies to conditions where cathodic protection is designed primarily for the structure (or structures) of a single operator. Frequently, however, where reasonably adjacent structures of two (or more) operators are subject to similar corrosion damage, "joint cathodic protection systems" can be designed, installed and operated economically to the benefit and satisfaction of all concerned.

The fundamentals of cathodic protection are relatively simple, but solution of its technical and economic problems requires a high degree of engineering skill. The harmony in which metropolitan engineers have coordinated their complex electrolysis problems sets the pattern for the cooperation needed to deal with local cathodic protection problems in the field. These call for a business judgment by all concerned, and an approach based on mutual appreciation of the equities and resultant benefits.

The use of cathodic protection offers widespread opportunities for reducing the enormous losses incident to underground corrosion, and its application requires cordial intercompany relations. Thus it is good business for all managers of buried plant to be generally informed about, and to give sympathetic support to their engineers dealing with the application of cathodic protection.

Secondary Recovery

Two Major Factors Promoting

By GEORGE FANCHER

There was an old woman who lived in a shoe.
She had so many children she didn't know what to do.
So she gave them some broth without any bread
And spanked them all 'round and sent them to bed.

THIS nursery rhyme, so familiar to each of us, might well have been paraphrased and applied to the oil and natural gas industry not too long ago because the industry had so much gas it didn't know what to do. Like the old woman, it solved the problem by punishment, partial sustenance, and ignoring the problem until the next day. Here the parallel ends because our imagination was required to speculate what the old woman did on the morrow whereas what the oil industry has done about gas is a matter of record. Although known natural gas reserves are at an all-time peak of some 165 trillion cu ft, the oil industry knows what to do with natural gas. Today natural gas in the United States is used wisely for heat and fuel and to increase the recovery of petroleum and valuable hydrocarbons from the oil fields. True conservation of vital and irreplaceable minerals is practiced because true conservation of natural resources, in my opinion, is the wise use of a natural resource and is not the hoarding of it.

Repressurizing In 1901

The use of gas for increasing the recovery of oil developed naturally in the older oil-producing regions of the United States and in those fields where the rate of recovery was too low to be profitable under the prevailing economic conditions. Natural gas was used for the repressuring of an oil reservoir in the Macksburg field near Marietta, Ohio, in 1901. As favorable results were obtained the Marietta process was applied to other fields requiring stimulation and the injection of gas into a reservoir as a secondary method of recovery of oil became an accepted practice in the older oil fields of the Appalachian region. Moreover, flush oil fields were relatively easy to find in the period 1912-30, particularly in the mid-continent and western oil-producing areas of the United States; consequently interest in and application of the Marietta process of secondary recovery developed slowly. Perhaps this was partially a result of the inevitable emphasis which was placed on the time sense of the adjective *secondary* in contradistinction to the adjective *primary*.

About 1927 scientific research and technological investigation began to be utilized by the oil industry and fundamental principles of the origin, accumulation and production of oil began to be understood. Today over $10 million per year is being spent on such research by the oil industry, oil-producing states and educational institutions. As a result, an impressive amount of fact from laboratory research supported by experience in the field may be applied to the problem of conservation and recovery of gas and oil.

Oil and gas are fluid minerals occurring within the pores of permeable rocks, usually overlaid by relatively impermeable rocks. Such permeable, porous rocks constitute reservoirs for oil, gas and water. Inasmuch as the amount of oil and gas is relatively small and that of the rock great, the only practicable method thus far devised to reduce oil and gas to possession is to take advantage of their ability as fluids to flow in response to controlled differences in pressure. Moreover as fluid is removed from the pores of a rock, some fluid must replace the fluid thus removed.

Practically speaking, as oil is removed by production from a rock, gas or water or some combination of both must take its place. The oil obtained by replacement with the gas or water naturally associated with the oil in the reservoir rock is said to be recovered naturally by a *primary method of recovery*. If, however, the necessary gas or water is injected into the petroleum reservoir to assist in the expulsion or displacement of the oil from the rock into wells, the oil so obtained is said to result from a *secondary method of production* and the operation is said to be *secondary recovery* in *type*.

Definition

The adjectives *primary* and *secondary*, modifying methods of recovery, were appropriate in a true time-sense in the early days of the industry, because naturally the first and only method employed to recover oil relied upon the use of only that gas and water occurring naturally in the reservoir. When, nearly half a century later, the fluids, gas and water, were injected into partially depleted reservoirs, the term "secondary methods of recovery," was devised to describe the process in contradistinction to primary methods of recovery. From the technological point of view the two methods of recovery clearly differ solely in regard to whether fluid is injected into the reservoir or not. Consequently, the definition of secondary recovery approved in Chicago in November, 1948,

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Complete statistical data are not available on the utilization of gas for pressure maintenance. However, it is known that great strides have been made in putting gas to work in this way, thus halting a great deal of flaring and saving the gas for future use as a fuel. In this article, Mr. Fancher gives figures which indicate the amount of gas that is being conserved nationally.

The author, professor of petroleum engineering at the University of Texas, Austin, presented this paper before the winter meeting of the Interstate Oil Compact Commission, Wichita, Kan., Dec. 9-11.

Conservation of Natural Gas

Underground Storage

By H. J. WAGNER

THE storage of gas is not a new tool to the gas industry. The large gas holders of the manufactured gas companies have been a familiar sight for many years. More recently, however, the pumping of gas into depleted or partially depleted gas and/or oil sands has become an indispensable part of the operations of many natural gas companies and one company is now storing natural gas in buried sections of pipe, and another in bottles.

A plant to liquefy natural gas and store the gas in the liquid state was operated for several years in one of our eastern states; the storage of natural gas as a hydrate has been given serious study during the past few years; and some work has been done on the problem of storing gas in sands that have never produced oil or gas. In addition to the above, the suggestion has been made that it might be possible to store gas in abandoned coal, limestone or other mines.

According to available data, natural gas was successfully stored over 30 years ago. Manufactured gas is also being stored underground at the present time.

In the early days of the natural gas industry, in the Appalacian area, wells were drilled in or near towns or cities and the gas piped into the community. As production from these first wells declined and the loads increased, it was necessary to go progressively farther away from the markets to find an adequate supply. First to the adjoining counties, then to neighboring states, and finally, after the successful development of the long gas transmission pipelines, to the greatest known natural gas supply in the world, the Mid-Continent and the gas producing areas in the southwestern part of the United States.

Gas is the most convenient way known of providing space heating, and therefore, in areas where the gas was plentiful and the price not too high, such as the Appalachian region, large space heating loads were attached to the lines of the natural gas companies. Today it is not only the most convenient but also the most economical way of providing space heating in nearly all sections of the United States. Even people living in the great coal producing areas in the states of West Virginia, Pennsylvania and Ohio are not only asking for but demanding that they be provided with gas service. West Virginia, which still exports a large part of the gas it produces, is the only state in the Appalachian area where restrictions on the extension of gas service are not in effect.

Now unfortunately for the gas companies, space heating, in the Appalachian area, requires large volumes of gas for only a few months each year. To offset the poor load factor of this load, gas companies operating in the area have in the past, and are at the present time, selling large volumes of gas to industries. These sales are *not* what is generally referred to as dump gas or interruptible sales. Nearly all of this gas is sold at firm rates and is used for processing, heat treating or other manufacturing operations where a better product can be made by using gas. There is practically no gas used for boiler fuel in the Appalachian area.

Under the laws or regulations of most if not all states in the Appalachian area, gas requirements of domestic and commercial customers take preference over the requirements of industrial customers when the supply is not sufficient to meet all needs. Under these laws or regulations, declining production and increasing demand, particularly for space heating gas, has in recent years caused serious interruptions in the operations of those industries that depend on gas for their fuel requirements.

The underground storage of natural gas as practiced in the Appalachian area was developed to meet this situation and had its real beginning in 1934. During the period from 1934 to the end of World War II, approximately 50 underground gas storage pools were developed.

Storage Field Hunt

As the distance between the load centers and sources of supply increased, the need for more and more storage became apparent. At the present time, with approximately 40% of our gas supply coming from the great gas fields of the Mid-Continent and the Southwest, the search for additional storage areas is on in earnest. There are at this time in various stages of development or under investigation in the Appalachian area at least 25 major pools and, if we add the small pools, some of which have only one well, the figure would probably be increased to nearer 50.

In the early gas storage days, pools that could deliver large volumes of gas for only a few of the coldest days were required. These pools generally were small in area and gas was put into and withdrawn from them through a few wells. While we still need these small pools we must also have, in order to meet present demands and provide a reasonable load factor on the long pipe-

(Continued on next page)

The underground storage of gas is a conservation measure not only in the prevention of physical waste, but also from an economic standpoint, Mr. Wagner believes. In the Appalachians, it has obviated the shutting in of many wells, a frequently wasteful device. It has also effected a big saving for the distributor by making it possible for him to take gas at a higher load factor.

The author, who is engineer director of the gas division of the Public Service Commission of West Virginia, Charleston, presented this paper before the winter meeting of the Interstate Oil Compact Commission Dec. 9-11, at Wichita, Kan.

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lines, very large pools in which gas can be stored during the summer months and from which it can be withdrawn during the five or six coldest months. Such pools have been and are continuing to be developed.

134 Billion Stored

The storage fields presently being operated in the Appalachian area range in size from approximately 50 acres for the smaller to over 25,000 acres for the larger. During the early part of this year the major natural gas companies operating in this area estimated that at the beginning of the present heating season they would have approximately 134 billion cu ft of gas in storage, that withdrawals from storage on a peak day would be over 1 billion cu ft, and that withdrawals for the entire heating season, during the winter of 1948-49, would be over 56 billion cu ft. At the beginning of the winter heating season of 1951 - 52, these same companies estimated they would have over 250 billion cu ft of gas in storage, from which they could withdraw over 2 billion cu ft on a peak day and approximately 93 billion during the entire heating season. It is my understanding that the above figures were based on the pools that were developed and in operation during the early part of this year. Assuming an adequate gas supply, one that would permit full operation of all pools—both those presently being operated and those that will be developed in the next few years—I believe that the above figures can be doubled if needed.

Now what does all of this have to do with conservation? In my opinion the underground storage of gas has proved to be a conservation measure not only in the prevention of the physical loss of billions of cubic feet of gas but also from an economic standpoint.

The average gas well in the Appalachian area produces less than 50,000 Mcf of gas per day. To shut in such a well or to hold back its production by high line pressures not only reduces the total annual volume of gas which the well produces but also results in the necessity of frequently bailing to prevent the well from being completely drowned out. Without storage thousands of these wells would have been abandoned leaving billions of cubic feet of gas, which we are now recovering, in the ground.

The combined daily production from all of these wells is not large, but producing them practically 365 days a year and pumping the gas into a few storage pools, close to the markets, not only provides large volumes of gas when and where needed to meet a peak load, but also results in a much lower investment in pipelines and pumping equipment.

The rate schedules under which southwestern gas is delivered by the pipeline companies into the Appalachian area are two part rates, generally referred to as demand commodity rates. The reason for using such rates needs no explanation, but it might be worth while to consider just one of these contracts, to determine the effect of the load factor on the cost of gas delivered from the Southwest to the Appalachian area. This contract is for delivery of 100 MMcf per day. The demand charge is $2 multiplied by the contract demand; the monthly commodity charge is 12.2 cents per Mcf of natural gas delivered. The contract also contains a clause which requires the buyer to take or pay for 75% of the contract quantity. Under this contract, gas is being delivered to the buyer in the Appalachian area for just under 19 cents per Mcf if deliveries are taken at 100% load factor. However, should the buyer take gas at a 50% load factor the cost would increase to 31.5 cents per Mcf, to which of course would have to be added all local transmission and distribution costs.

Gas sold in the Appalachian area for industrial uses has always been sold in competition with coal and oil and the insatiable demand that now exists for space heating gas proves conclusively that this is also true today of gas sold to residential and commercial customers. It is of course not possible to estimate the volume of gas the distributing companies would be selling today if gas delivered from the Southwest was costing 31.5 cents instead of 19 cents, the current price. It seems fair to assume, however, that this volume would be very much less than present sales.

The field price of gas in the southwestern states has been substantially increased during the past few years principally because of the market provided by the long pipelines. This increase and an anticipated further increase in the field price of gas have been large factors in making the present commendable gas conservation programs of those states possible.

Ernest O. Thompson, chairman of the Texas Railroad Commission, recently said:

> An increased field price for gas would be the greatest conservation measure that could be adopted. We would hear no more discussion of end use, competing fuels, or necessity for additional conservation rules and regulations. Price is the control. When a commodity begins to have an increasing market value, self-interest comes into play and the owners themselves begin to put forth the proper effort to prevent waste.

While other factors have had their effect I believe that the underground storage program of the gas companies operating in the Appalachian area has saved billions of cubic feet of locally produced gas and also that it has provided a market for a larger volume of southwestern gas, much of it casinghead gas and at a higher price than would exist today without storage.

Secondary Recovery

(Continued from p. 38)

by the subcommittee of the American Petroleum Institute depends only upon the fundamental technological difference between primary and secondary methods of recovery, namely the injection of gas or water or of both.

The term secondary recovery is broad in scope and other supplementary definitions are in use in the oil industry to indicate the purpose or the time of injection of fluid as the need may be. For example, if water is injected into a reservoir as the end of the period of possible primary production is approached or even after it has been achieved, the process generally is called *water-flooding*. If gas or air is employed at this time instead of water, the process usually is called *repressuring*. If either gas or water or both are injected into the reservoir relatively early in the production life of an oil field for the purpose of increasing the recovery of oil, the process usually is called *pressure maintenance*.

The important fact is that all these operations are *secondary recovery operations* in *type*. If these important definitions are clearly understood, the task of interpreting statistical data to evaluate the results obtained from secondary methods of recovery is facilitated greatly and the remarkable achievements of the American petroleum industry, resulting from the employment of secondary methods of recovery to increase the efficiency of producing oil, will be recognized.

The use of gas in secondary methods for the recovery of oil includes pressure maintenance and gas-repressuring as conservation measures. The early producer of oil had little knowledge or appreciation of petroleum engineering and particularly of conditions prevailing within petroleum reservoirs. When oil was found, it was produced as rapidly as possible and no state regulatory body existed to prevent the prevalent practice. Each operator endeavored to get as much as possible from the common source of supply in the reservoir.

TABLE 1. EXAMPLES OF CONSERVATION OF GAS AND OIL IN THE UNITED STATES BY SECONDARY RECOVERY AND UNITIZATION*

State	No. of Fields*	Production Area Developed (acres)	Area Unitized Developed and Undeveloped (acres)	Producing Wells (Number)	Estimated Primary Recovery (MM bbls.)	Estimated Increase in Recovery (MM bbls.)	(%)
Arkansas	3	21,636	19,984	481	73.4	49.5	67.5
California	4	35,850	64,075	1,141			
Colorado	1	5,510	31,500	31			
Illinois	1	22,300	3,400	1,850			
Illinois and Indiana	1	13,460	3,600	1,374			
Kansas	4	4,940	5,180	506	27.3	3.4	12.4
Louisiana	3	29,510	35,347	317	93.5	35.1	37.5
Mississippi	1	8,500	13,003	129	45.0	19.0	42.2
New Mexico	1	30,000	920	330	1.0	0.2	20.0
Oklahoma	3	34,900	33,480	1,081	178.9	62.6	35.1
Texas	2	1,869	2,611	5	2.5	2.5	100.0
West Virginia	2	27,500	12,900	2,350			

*Based on incomplete data available in files of Interstate Oil Compact Commission in 1948.

Usually, when gas was found, it was wasted as rapidly as possible to the atmosphere to facilitate the migration of oil to the wells. This kind of primary production practice recovered but a small portion of the oil potentially recoverable, usually ranging from 10 to 25% and probably seldom exceeding 50%.

As producers learned more of the nature and behavior of reservoirs, they were able to utilize better and more efficiently the natural forces of encroaching water and expanding gas to increase the recovery of oil. Present-day good conservation practice frequently dictates the orderly withdrawal of oil in accordance with the type and effectiveness of the natural driving agencies and by the injection of natural gas stripped of recoverable liquid hydrocarbons. Reservoir pressure can be maintained in this way and the ultimate recovery of oil materially increased.

Reservoir Viewpoint

An essential requirement to effect material increase in the recovery of oil by any method of pressure-maintenance usually is that the properties involved be unitized. Petroleum reservoirs are no respectors of property lines and because the whole is equal to the sum of the parts, maximum recovery can only be achieved through maximum recovery of oil from each and every pore in the reservoir. Consequently, the *reservoir point of view* is essential to maximum success in any secondary recovery operation such as pressure maintenance. Although some operators in the oil industry still either are unconvinced of these scientific facts or perhaps choose to ignore them and hence are inclined to operate from the point of view of lease rather than reservoir boundary lines, nevertheless remarkable progress in voluntary cooperation and unitization for the purpose of achieving maximum ultimate recovery of oil is being made.

For example, the secondary recovery advisory committee of the Interstate Oil Compact Commission has prepared a resolution requesting the commission to "forthwith call to the attention of the people, the legislatures, and the officials of each of the petroleum producing states the need for reviewing their statutes with the purpose of amending or improving present laws or of passing new legislation at the earliest possible time so as to authorize the making of voluntary agreements and pooling or unitization of property interests in any oil or gas field or reservoir" for the purpose of increasing the ultimate recovery of oil. This resolution was approved by the executive committee of the commission and finally by the commission as a whole at the Chicago meeting in November, 1947.

100 Projects

Some 100 unitized projects are known to be in operation and no doubt others have not been reported in the statistical surveys undertaken. Operators in 12 states reported the unitization of 226,000 acres in 24 fields with 9595 wells producing from 235,975 acres *(Table 1)*. Gas is being used in some of these projects to maintain pressure; incomplete data indicate that the recovery of oil in 18 fields in 7 states will be increased by 12.5 to 100% from nearly 129,000 productive acres *(Table 1)*.

Remarkable results have and are being obtained through pressure maintenance projects in fields and reservoirs adapted to this operation. Large volumes of gas which otherwise would be wasted or used as fuel before all the work they could do had been done are being returned to oil producing formations to maintain the reservoir pressure, and to increase the total recovery of liquid petroleum. Unfortunately complete statistical data for the use of gas for maintenance of pressure are not available and probably will not be until the secondary recovery division of the commission has completed the study now being made. Partial data from various sources provide some idea concerning what is being done.

For example, in Texas since September, 1945, new gas conservation projects placed in operation have provided for the injection of gas at the rate of 289 MMcf per day into at least 24 different fields and reservoirs to maintain reservoir pressure and increase the recovery of liquid petroleum products. Incidentally, 289 MMcf is equivalent to about 8000 tons of gas, and this is only 3% of all gas produced in Texas. Furthermore, in March, 1948, new projects were being undertaken which would provide for the injection of about an additional 100 MMcf per day of gas into 13 additional fields and reservoirs, and at least 16 additional projects providing for the return of about 140 MMcf were being planned. These projects, all new since September, 1945, conceivably could lead to the recovery of at least 1 billion bbls of

oil from the fields of Texas which otherwise could not be obtained.

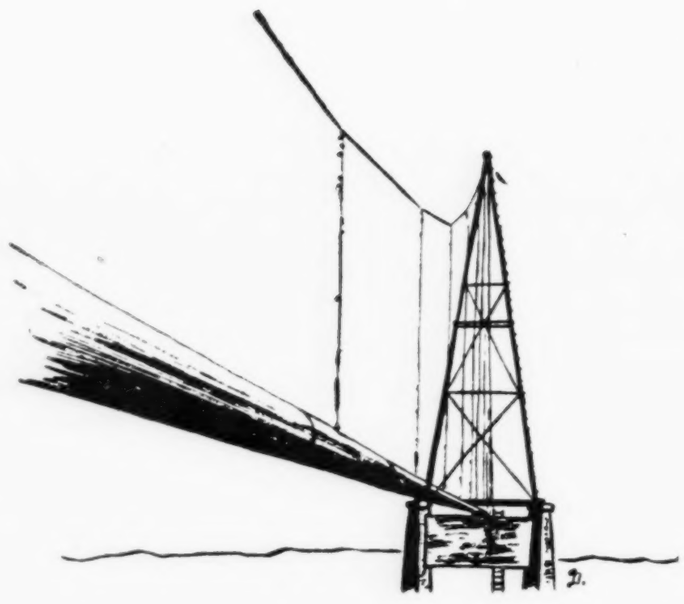
Similar projects known to be operative in the Rocky Mountain states of Colorado, Montana, and Wyoming are utilizing gas at the rate of about 18.5 MMcf per day in an area of about 66,900 acres affecting some 3000 oil wells. From these wells it is estimated that already about 50 million bbl of oil have been obtained which otherwise could not have been produced.

315 MMcf A Day

In California, gas is being returned to 11 fields and reservoirs at an approximate rate of 315 MMcf per day to maintain pressure and increase the recovery of liquid petroleum. In Arkansas, in the Schuler field alone, injection of gas to maintain pressure will result in the recovery of 80 million bbl of oil instead of 35 million, which would have been the total, if a conservation program had not been in effect. An attractive feature of pressure maintenance in the injection of gas to maintain pressure and increase the recovery of oil is that the gas so used is stored and thereby made available for use in the future.

Particularly in the Appalachian region where gas is precious, consideration is being given at this time to the storage of gas brought in from the southwest by long-distance pipelines in oil bearing reservoirs during periods of low consumer load. An increase in the recovery of oil is thereby obtained, better service to consumers is maintained and, most surprisingly, no gas is lost by the storage. In fact, the gas stored is augmented by a contribution from the oil-bearing reservoir and the final volume obtained is somewhat larger than that injected. Furthermore, the average heating value of gas so stored is increased. Many oil fields adapted to such operations are located near the large consuming centers of population in the industrial East. The operator of the long-distance pipeline reaps the advantage of continuous operation under high load factors when gas is so stored.

The story of the use of gas in gas-repressuring of older fields of the United States has never been properly told and probably never can be because of lack of reliable data. The Secondary Recovery Division of the Interstate Compact Commission is endeavoring to obtain such data as may be available. Many oil fields in the United States would have been abandoned if it were not for gas-repressuring, which makes possible maintenance of profitable operation of wells, leases and entire oil-fields with relatively low additional investment. Consequently, air



and gas repressuring frequently provide sufficient income to discourage the premature abandonment of wells, leases and entire oil fields. Upon a recent visit to the oil fields of Pennsylvania, one of the most impressive sights I saw was a lease, located just a few miles from the Drake well and nearly as old, which not only was still being operated profitably but also upon which each well was flowing as a result of gas repressuring, despite the fact that no well on the lease had flowed upon discovery some 75 years ago.

Illinois Report

Other typical achievements of secondary recovery in the form of gas repressuring include the injection of gas into three fields in Illinois at the rate of about half a million per day resulting in the recovery to date of nearly 1.75 million barrels of oil which otherwise could not have been obtained. Furthermore, probably about 2.75 million bbl of oil, for which more complete information is not available, have been obtained by gas-repressuring in Illinois.

In Oklahoma gas-repressuring projects are so numerous that an accurate evaluation of results has never been possible. Indicative of the accomplishments is the known increase in recovery of nearly 60 million bbl of oil from some 11,000 oil wells, resulting from the injection of gas at the rate of about 60 MMcf per day. In the North Burbank field alone 25 million is being injected to more than 200 input wells.

The story of gas-repressuring in Texas is decidedly incomplete. In "Secondary Recovery of Oil in the United States," Cable estimated that gas-repressuring operations in 1940 were being conducted in 33 counties throughout the state by some 250 different operators involving 4200 oil wells and 537 injection wells. Indicative of accomplishment, data recently available for 44 projects affecting nearly 5000 productive areas and 875 oil wells reveal that an increase of 13.6 million bbl of oil already has been produced through the injection of gas at the rate of about 5 million per day. From the standpoint of conservation a little gas accomplishes much in gas-repressuring.

Small Jobs

The real story of this chapter of conservation in Texas is even more dramatic because many of the operations are one-compressor, one-lease jobs which enable a small independent oil producer to stay in the oil business. The value of gas and oil obtained by secondary methods of production in terms of present worth may be trivial and equal to only 10 to 25 cents per barrel, but in terms of taxes, jobs and other items of public good will could be valued at $10 per barrel.

In summary, conservation of natural gas is being accomplished in ever-increasing amounts in the oil industry. About 5.6 trillion cu ft of gas was produced in 1947 and a greater amount will have been produced by the end of 1948. Probably no more than 8 to 10% of this gas is wasted by flaring, the remainder being conserved by use for fuel, secondary recovery operations and other useful purposes. Further breakdown is difficult for the United States as a whole because of lack of reliable data.

In Texas, 2.5 trillion cu ft of gas (45% of all gas produced in the United States) was produced in 1948 of which about 65% was marketed for fuel and manufacture of useful products, 20% was used for secondary recovery of petroleum, and 15% was flared or vented to the atmosphere. Of the amazing figure of 20% used for secondary recovery of petroleum, three-fourths was used for maintenance of pressure and one-fourth for repressuring. Although distribution of use for gas in Texas is not the same as in other portions of the country, nevertheless the trend in use is illustrated by these figures.

Airview of the $5 million Cities Service Gas Co. North Hugoton compressor station near Ulysses, Kan. Auxiliary facilities and a housing project for company employees are also shown. The company's 182-mi., 26-in. natural gas pipeline which extends to Hutchinson, Kan., and was completed in December, starts here. Estimated cost of the 400-mi project is $36 million.

Hugoton Station Delivers 100 MMcf Daily

By O. D. HALL

FOLLOWING nearly three years of intensive effort and the overcoming of many difficulties, the Cities Service Gas Co., Oklahoma City, completed compressor and transportation facilities on Dec. 4 which made available an additional 100 MMcf of gas daily to consumers connected to the west side of its system. This accomplishment was announced by S. B. Irelan, company president, with the completion of a 182-mile section of 26-in. natural gas pipeline connecting the Hugoton-Kansas gas field with its five-state system.

Exclusive

The last section of pipe was welded to a connection with underground lines crossing the Arkansas river at a point about one mile south and east of Hutchinson, Kan., where the existing gas transportation network is entered.

The project extends from the company's new North Hugoton compressor station, located near Ulysses, Grant county, Kansas, to Hutchinson. From the latter point, the new 26-in. line is being extended northeast an added distance of about 23 miles for an additional connection with a smaller line northwest of Newton, Kan.

Another section of the Cities Service Gas project was completed during the summer for a distance of approximately 50 miles between Ottawa and Kansas City, Kan. This stretch of line is now in service carrying gas for market use in the Kansas City area.

In announcing what ultimately will be a $36 million project designed to supplement gas supplies for a rapidly expanding market demand, President Irelan also made known the completion of his company's new 17,600-hp compressor facilities near Ulysses, known as the North Hugoton station.

By late 1949 or early 1950, the pipeline company expects to finish the remaining section of its new line between Hutchinson and Ottawa, Kan., a distance of approximately 150 miles, and thereby connect the Hugoton field with the east side of the market territory, including Kansas City.

Eventually the whole project will have a daily delivery capacity of approximately 370 MMcf of gas for the pipeline network. Maximum deliverability of the company's system, without benefit of the new line, is about 630 million; on ultimate completion of the entire 400-mile gas artery across the state of Kansas, total delivery capacity will be boosted more than 50%.

An early obstacle to be overcome was a critical shortage of steel, common throughout the nation. Finally the company succeeded in contracting with the Sheffield steel interests at Houston for some 55,000 tons for initial delivery. This sheet steel was transported by water and rail to Milwaukee for fabrication by the A. O. Smith Corp. Ordered in 1946, this steel was not ready for delivery to the Western Kansas station until the spring of 1948 owing to transportation and other difficulties. Once started, the contractor progressed at a rate of 1½ miles each day on the Ulysses or western section of the line.

Work on the North Hugoton compressor station near Ulysses began in October, 1947, but an unusually severe winter slowed construction of the station and the employee's housing community.

GAS, in two previous articles, recounted the plans and beginnings of the work on the compressor station and the community housing facilities, and also some of the principal engineering

Workmen align some 26-in. pipe, using an internal line-up clamp.

difficulties confronted and overcome in construction of a part of the pipeline.

With the first section of the compressor station completed and pumping gas into the new line some technical and operating details now can be added. The plant was designed to operate with an intake pressure of 260 psig and a discharge pressure of 900 psig, with an initial capacity of 235 MMcf per day.

The investment required for the initial station, dehydration plant, company camp, and employee housing will be approximately $5 million. The main compressor units consist of 11 type 26 Cooper-Bessemer units having a manufacturer's rating of 1600 hp each, or a total of 17,600 hp. The engines were equipped with a dry type rectifier ignition system, operating from the plant auxiliary generating units. A centrifugal type oil purifier was installed in the oiling system for the units.

The main building to house the compressor units is approximately 72 ft wide x 375 ft long and is of steel frame, corrugated transite construction. The building has a full basement in which are located the water piping headers and other service lines. Heating of the building is by steam unit heaters.

Both water and gas coolers for the plant are of the radiator type which utilizes air for cooling. The water supply is obtained from two wells approximately 300 ft deep. Make-up water for the equipment is treated in a demineralizing water-treating plant before being added to the water system. The auxiliary engines consist of 4 type JS-8 Cooper Bessemer 600-hp gas engines, directly connected to 400 kw, 480 volt, General Electric generators.

The main electrical switchboard is of the enclosed cabinet type with draw-out air circuit breakers. The main power circuit serving the water coolers is a weatherproof, overhead, bus duct. All other circuits are underground.

All of the yard piping was designed for 1000 psi operating pressure, and the ASA code for pressure piping was followed in the design of the piping. To do away with any pulsating gas flow from the compressors, pulsation eliminating equipment was installed on the suction and discharge lines of each compressor.

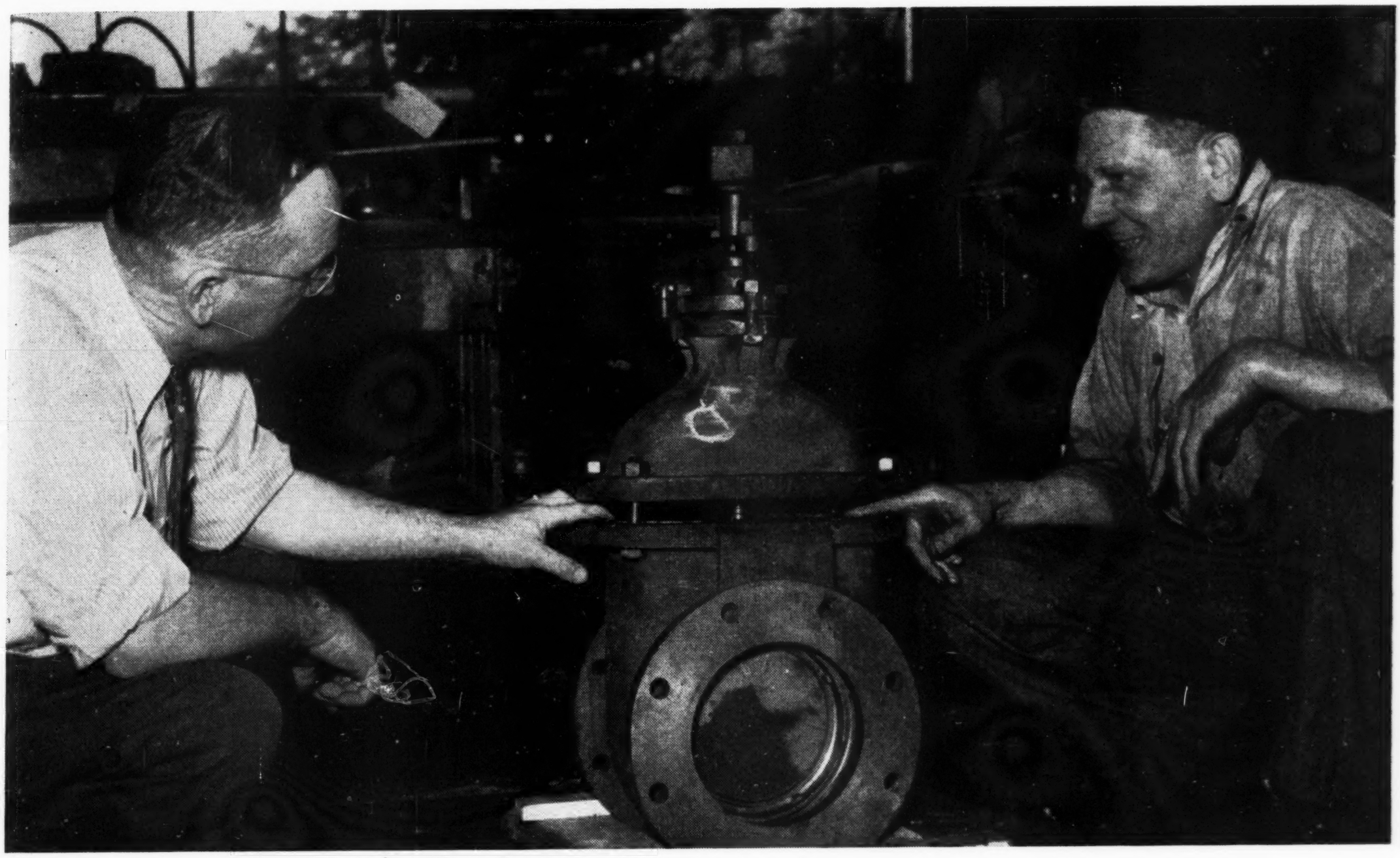
The Hugoton dehydration plant is the solid absorption type, which utilizes activated bauxite. Four splitflow contacting towers, 7 ft in diameter x 47 ft high, were installed. The regenerative gas heater is a Petro-Chem type and the regenerative gas cooler is a radiator type unit.

A modern dwelling unit was installed on the plant site to accommodate the operating personnel. A total of 51 modern, full-basement houses for employees was constructed. A recreation building also was constructed for use of plant personnel. The plant site consists of 320 acres with paved streets. The site is to be landscaped. Also on the location is a modern airplane landing strip, constructed to accommodate company planes visiting this part of the system.

Cities Service Gas Co. takes for its 26-in. line 100 MMcf of gas per day from the Magnolia, Stanolind, and United Carbon companies' wells in the Grant county, Kan., sector of the Hugoton field. These companies have dedicated to this purpose roughly 400 producing wells and 375,000 acres of gas producing land.

Some sizeable statistics regarding materials used have been revealed with completion of the project. The Ulysses-Hutchinson line required 40,650 tons of steel, together with 3050 tons of pipeline enamel and 87,000 squares of pipeline felt. On the Ottawa-Kansas City section, the contractor needed 11,000 tons of steel and 823 tons of paint.

Double-jointing 26-in. pipe into 80-ft sections ahead of the regular lining and welding operations.



Adolph Gollus (right) demonstrates his money-saving idea to George F. Tucker, Washington Gas Light Co. shop foreman.

Non-Interrupting Valve Repair Method Invented by Mechanic

Money rained in for Adolph Gollus, who dreamed up a method of repairing valve gaskets which is saving his company approximately $100 on each repair job.

He figured out how a leaking bonnet flange gasket on gate valves can be easily and safely replaced without shutting down the line or removing the valve—provided that the valve can be closed during the progress of the work and the gates of the valve are reasonably tight in the closed position.

His system of replacing bonnet gaskets and repacking valves is here described, step-by-step.

Adolph Gollus, maintenance mechanic for the Washington (D. C.) Gas Light Co., has received $250 for suggesting a method whereby gas main valves can undergo certain major repairs without removing the valves or bagging off the mains. Mr. Gollus stands to net at least another $250 which the company will pay him if estimates of the value of his idea prove accurate.

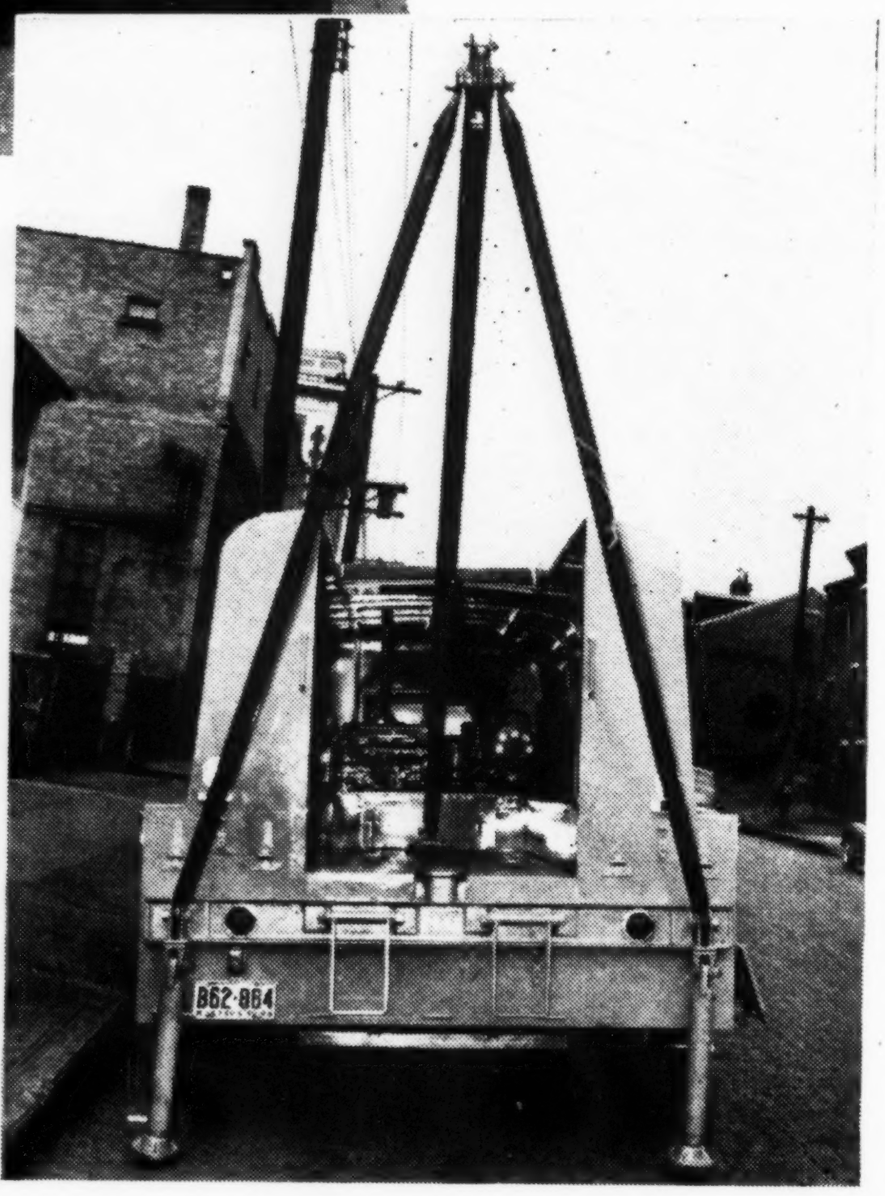
Using his system, gaskets have been changed on a considerable number of valves under line pressures of 10 to 20 lb, and tests have indicated that changes at a line pressure of 100 lb are feasible. The only special equipment required is four bolts that are approximately 1½ in. longer than those in the bonnet flanges, with the bolts threaded longer than standard.

Here's Mr. Gollus' method:

1. Close the valve tightly and remove the test plug in the bonnet. If there is none, loosen the stuffing box until leakage occurs. This test determines how badly the valve gates leak.
2. Replace the four corner bonnet flange bolts with the special longer bolts.
3. Remove the remaining bonnet flange bolts.
4. Slack off—about ⅛ to ¼ in—the nuts on each of the four corner bolts. *Simultaneously* retighten the valve stem to reseat the gates. Another check of leakage through the valve discs is obtained as the bonnet flanges separate. If leakage is too great for safe procedure, the flanges can be retightened; if not, work can proceed.
5. Repeat step No. 4 until the flanges are 1 to 1½ in. apart. Don't raise the flanges too high or the valve stem will come unscrewed from the gates.
6. Remove the old bonnet flange gasket, clean flanges, insert a new gasket—one which has been cut with a dovetail joint. Preferably, this joint should be placed opposite one of the bolts.
7. Reverse step No. 4 until flanges are in contact, replace the flange bolts, test for tightness.

Either two large paving breakers or two pneumatic hammers can be operated at the same time from the compressor mounted in the new gang truck. Tool boxes on either side carry hose and equipment for pneumatic tools. On the far side of truck, a special compartment houses derrick poles for winch.

With tool boxes on each side and at the rear, the truck can carry all tools for a full crew and can transport as many as 20 men to distribution jobs. In bad weather, canvas is unrolled to provide protection for the crew riding inside.



How derrick poles and reinforcing legs are mounted when winch is in operation. Two-stage K-105 Ingersoll-Rand compressor sits just behind cab. Steps and hand bars assist crew in mounting or dismounting.

Gas Company Develops 20-Man Gang Truck For Distribution Work

A new idea in gang trucks has been developed by the Natural Gas Co. of West Virginia. A few weeks ago this efficient distribution department truck emerged from the Moundsville garage where it had been constructed under the supervision of Foreman Frank Weinzierl.

Basic ideas for the new gang truck were formulated in 1946. G. E. Wilson, superintendent of distribution, coordinated the various plans for augmenting the design and shape of the body that had been conceived by Mr. Weinzierl.

Exclusive

After the 2-ton heavy duty Chevrolet chassis and the Ingersoll-Rand compressor were received at the Moundsville garage, work began on lengthening the truck frame and chassis. Rear wheels and axle were moved back 36 in., giving the truck a 196-in. wheelbase.

This alteration was necessary in order to provide sufficient length so the compressor and winch could be mounted, and still provide adequate room for building of seats. Twenty men can be transported in it—12 men in the rear, five on the tool box cover, and three in the cab. A canvas top rolled across the slot in the roof assures complete protection from rain or snow for all the passengers.

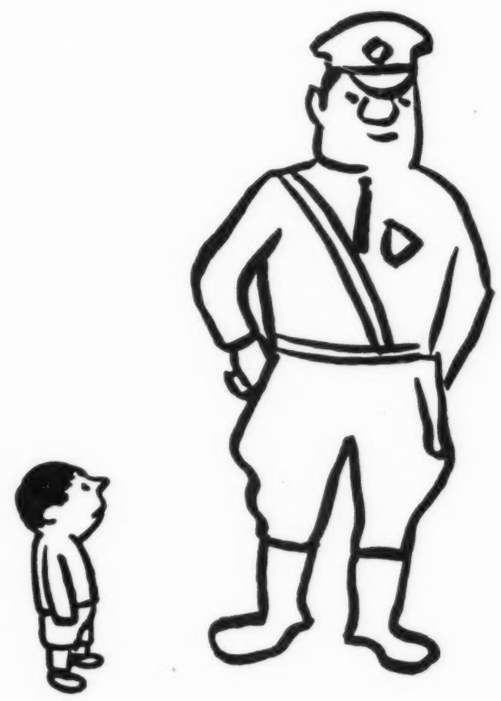
Dissolving the Holding Companies

A review of why the "death sentence" act was passed and progress made in executing it

By **HARRY A. McDONALD**
Commissioner, Securities and Exchange Commission

AMERICANS admire and distrust bigness. We are proud of the magnitude of our achievements, but we disapprove of too much government and we declare business monopoly illegal. The growth of industrial enterprise following the Civil War was paralleled by a developing public sentiment against too much bigness in business. The Sherman Act, the period of the muck-rakers, and later the other anti-trust laws were products of this public abhorrence of bignesss. There may be a vast disagreement about the remedial instruments chosen, but we all understand why such legislation was passed.

Originally, the electric and gas operating companies in this country were local businesses, locally operated and locally financed. Their steady growth, constant earnings, and need for capital to expand made them particularly susceptible to the current of consolidation which flowed through all business following the turn of the century. The process was rapidly accentuated after World War I when the giant utility combines began their phenomenal growth. Where this consolidation brought together integrated properties, it was of definite economic benefit.



"Americans admire and distrust bigness."

However, as early as 1924 the Senate expressed concern over the development and activities of the so-called "power trusts," and in 1928 it authorized the Federal Trade Commission to make an investigation of the public utility holding companies and their operations. This study lasted for seven years and has been referred to as "the most thorough-going investigation of an American industry that has ever appeared." From that study, conducted under Republican leadership, came the Public Utility Holding Company Act. The legislation was vigorously opposed by the entire industry. Many of you will recall the campaign waged against its passage. Consumers and security-holders were urged to "write their Congressmen," and a literal avalanche of mail and telegrams inundated the Capitol. The lobbying was so blatant that it became the subject of a special Senate inquiry. The Holding Company Act was one of the most controversial pieces of legislation ever enacted in this country.

Mere $600 Million

Typical of the holding company systems which Congress directed to be broken up, was the United Light and Power Co. It was of medium size, as holding companies go, not in the class of such giants of the industry as The United Corporation or Electric Bond & Share, yet the consolidated assets of the system, per books, aggregated nearly $600 million. The system consisted of several subholding systems comprising some 75 companies of various kinds, with as many as five tiers of companies. These subsidiaries operated in 12 states. The common stocks of the parent company were junior to $430 million of outstanding senior securities. This leverage produced wide fluctuations in the company's income, for earnings had to pass through nine strata of publicly held senior securities before becoming available to United Light and Power's common stock. A block anywhere along the line could put the parent's securities in default. By 1939 United Light and Power's preferred stock was about $28 million in arrears on dividends. It was a situation duplicated throughout the industry.

The Federal Trade Commission study had revealed that in 1932 three-fourths of the entire privately owned electric utility industry in this country was controlled by 13 large holding company groups. Three of those groups alone controlled 40% of the nation's private power, and there were interlocking relationships even among them. Control was centralized in the hands of a few individuals through various corporate devices such as pyramiding of companies and the issuance of vast quantities of non-voting securities to the public.

Concentration of Power

With that control came the power to dispense to a select few extremely lucrative contracts for engineering, banking and legal services. The unsound capital structures which were produced and the large amounts of write-ups carried in the accounts of both the operating and the holding companies made their securities easy victims of the first change in economic weather. The utility securities were among the greatest sufferers when the market broke in 1929. The Congress found that the concentration of this vast political and economic power in the hands of a few individuals and the manner in which this power was being used were contrary to the public interest. The remedy it chose to correct these "evils" was Section 11 of the Holding Company Act, the so-called "death sentence."

Congress recognized that in certain limited situations the holding company device served a constructive function in gathering into integrated systems

ON THESE PAGES are presented condensations of two important papers as abstracted by the staff of GAS.

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groups of operating companies which had grown up in local isolation. This benefit the act seeks to preserve by restricting holding companies to the ownership of integrated utility systems and related businesses. On the other hand, scattered, unrelated properties were required to be divested and holding companies serving no useful function were to be liquidated and dissolved. In addition, the non-utility businesses into which many systems wandered—such as amusement parks, oil wells, hotels, and the like,—had to be divested. These are the so-called "integration" provisions of Section 11 (b) (1).

"Three holding company groups controlled 40% of private power."

Simplification

The Congress further provided that the grotesquely pyramided capital structures were to be simplified, and voting power was to be redistributed so as to eliminate the unfair control exercised through a disproportionately small investment. These are the "simplification" provisions of Section 11 (b) (2).

The Holding Company Act is a "specialized anti-trust law." It differs from previous legislation in the definiteness of its standards and in its machinery for enforcement. In place of the general "rule of reason" used in the anti-trust laws, the Holding Company Act contains definite, precise tests; and enforcement, which is the specific assignment of the SEC as an expert agency rather than an additional task for the usual law enforcement agencies, is accomplished through actual plans of reorganization and divestment, instead of through orders to cease existing practices. Furthermore, Congress was careful to protect the rights of security holders by providing that adjustments had to be "fair and equitable," a standard given content through use in corporate reorganizations under the Bankruptcy Act, and by providing for full rights of judicial review.

Voluntary Action

A further innovation for this type of legislation was that in addition to providing for compulsory enforcement by commission action, means were also set up to enable the companies to bring themselves into compliance on their own initiative through voluntary plans. This was done, in the words of one of the bill's sponsors, in the belief that "the legal and economic imagination which put these holding-company combinations together will devise means of taking them apart." Very early in the administration of the act, the commission faced the important policy decision of which of the two routes to follow. It made what I consider the wise choice of relying primarily on the companies to submit voluntary plans. As a result, the compulsory provisions have remained as the ultimate sanction against hesitant managements. It was foreseen that the holding companies would be most reluctant to make use of the voluntary procedures provided for them. The President, in submitting the initial bill to Congress, made a very pointed observation. He stated:

> ". . . if the disappearance of the holding company excrescence is to be realistically expected at the end of a given period there must be a constant pressure on the managers of holding company enterprises, persistent from the very beginning of that period, to insure a continual process of whittling down complicated capital structures and of disassociating operating properties not related to each other geographically or economically."

Progress Report

Thirteen years have elapsed since the act went into effect. The job of Section 11 is well on its way to accomplishment, although several systems remain with difficult problems yet to be resolved. Since 1935, 470 companies, with aggregate assets of $11.3 billion, have been divested, some in sales to other holding company systems; 1431 companies have been released completely from SEC jurisdiction by sale, dissolution, merger, etc. There are now 46 holding company systems, having total assets of about $15 billion, subject to the Holding Company Act. As the Section 11 program is completed, many of these will also pass from our jurisdiction. But there will remain an as yet undetermined number of integrated holding company systems subject to SEC regulation.

The benefits of the integration requirements of Section 11 may be illustrated by the situation here in Detroit. In 1903 the North American Co. was instrumental in organizing the Detroit Edison Co. out of the two principal electric utility companies then serving the Detroit area. It retained for itself about 14% of Detroit Edison's voting securities, and from then on dominated the management of the company. In about 1925, the United Light and Power system, which already controlled the gas company in this locality, began to buy into Detroit Edison. From 1925 to 1931, the two holding companies vied with each other in purchasing the stock, until North American had over 23% of the stock, at an average recorded book cost of $24.38 a share, and United Light and Power had over 20%, at an average recorded book cost of $35.87 a share. United Light and Power, however, never obtained representation on the board until North American, under the compulsions of Section 11, divested its interest through dividend distribution to its stockholders in 1943.

Benefits for Detroit

United Light and Power's Detroit Edison investment was held by a subholding company in its system, the American Light & Traction. United Light and Power, as you know, has been dissolved, and United Light & Railways, which survived it, is currently disposing of its ownership of American Light & Traction. Just recently American Light sold publicly the last of its holdings of Detroit Edison. Thus, as a result of the Holding Company Act, the Detroit Edison Co. is now owned directly by the public and not by two absentee holding companies. Obviously, a large strong operating utility like Detroit Edison, regarded in the industry as one of the outstanding companies, has no need of a holding company parent.

Meanwhile, American Light & Traction, which also controls Michigan Consolidated Gas Co. in Detroit, is engaged in integrating its remaining gas companies into a cohesive system. This it is doing under a plan which the SEC approved Dec. 30, 1947. When the program is finished American Light & Traction will continue as an independent holding company. Its subsidiaries will be Michigan Consolidated, Milwaukee Gas Light Co., and Michigan-Wisconsin Pipeline Co. Michigan-Wisconsin will operate the natural gas transmission line now being built from Texas. The pipeline will enable the two gas companies to operate together as an integrated system and will provide them with the additional natural gas needed so badly by Detroit and the State of Wisconsin. The resources and credit of American are being used to finance the pipeline project. In this case, the holding company can perform a positive function, and it will therefore be permitted to continue.

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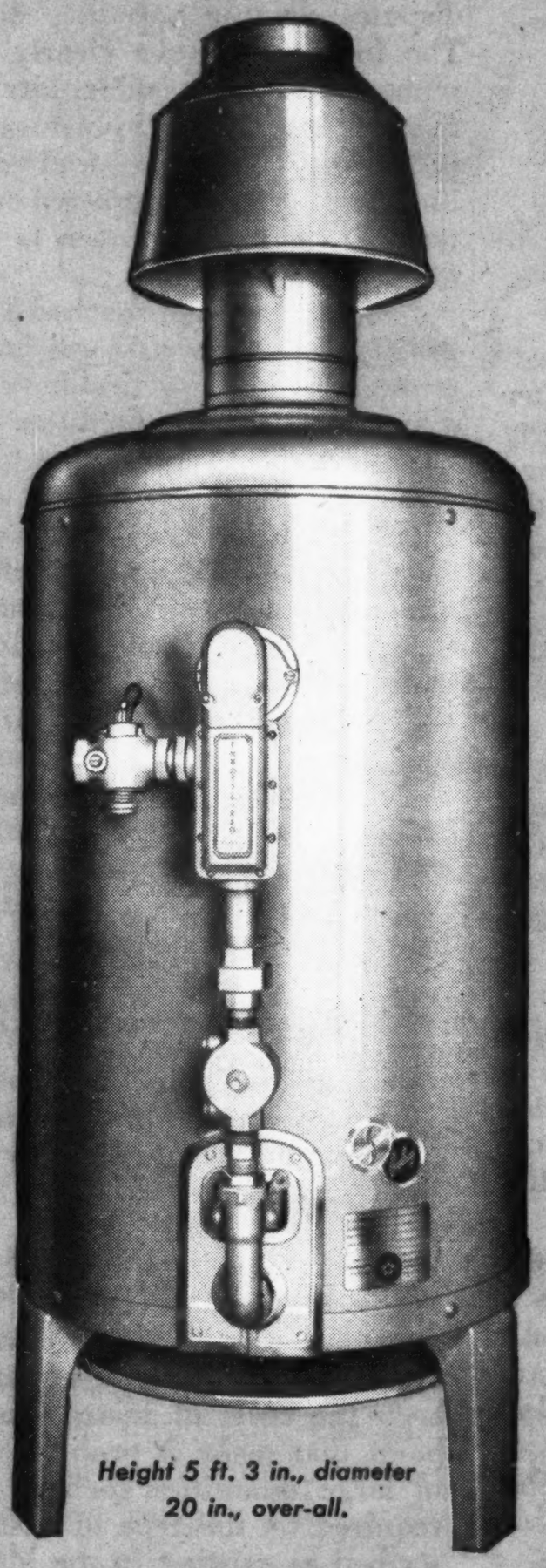

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Introducing Industry to Natural Gas

Fuel's impact on a highly industrialized area previously supplied with manufactured gas

By PAUL R. TAYLOR
Stone & Webster Service Corp.

THE delivery of natural gas through large diameter pipeline systems to areas heretofore unconnected with sources of natural gas always gives rise to much speculation concerning the use of that product. Communities never before served by natural gas are inquisitive concerning the characteristics, the cost, the reliability, the safety and the economic utilization of this fuel. Every area approached by natural gas pipelines shows keen interest in what the effect will be on local industry insofar as its improvement and growth are concerned. Based upon experience and observation, this paper has been prepared for the purpose of delineating the resultant effects upon industry in communities whose manufactured gas facilities have been either augmented by or adapted to natural gas.

The economic welfare of any community, the comfort of its citizenry, the existence of profitable industry and resulting employment of workers depend upon a continuous flow of fuel into the territory. This constant delivery of different kinds of solid and liquid fuel by rail and water is augmented in a most substantial manner when natural gas flowing freely through a pipeline is available. This fuel, free from impurities, non-toxic in character and reasonable in cost, exerts a profound economic influence upon the region into which it is introduced.

Minimum Labor

The relatively small amount of labor necessary for the production and transportation of natural gas makes its supply definitely less vulnerable to interruption by reason of labor disputes than the supply of other kinds of fuel. Its introduction into a region tends to unify local gas requirements. This relieves the difficulties imposed on refined heat operations often caused by the variety of combinations found in a manufactured gas picture involving coke oven, carburetted water, oil gas and liquefied petroleum gases.

The development of the use of natural gas for industrial purposes after its introduction into areas formerly served only by manufactured gas can be illustrated by some reference to the actual load growth history in areas which have undergone such an experience.

The Mobile Story

Natural gas was first introduced in Mobile, Ala., in 1930. The supply was provided by United Gas Pipe Line Co. and completely replaced carburetted water gas in the Mobile distribution system. The pattern of the present industrial load at Mobile is one that is different from the ordinary situation in that it consists largely of sales to half a dozen consumers on an interruptible basis. A combination of circumstances contributed to this situation.

About the time that natural gas was made available in Mobile, the State of Alabama sponsored and carried out a program of harbor improvement and dock building at Mobile. This development became a factor in the decision by large aluminum interests to ship South American bauxite to Mobile where it was reduced to alumina, a form of aluminum much lighter than the original ore. Alumina could then be shipped to other localities for reduction to aluminum at a cost much less than the former longer haul of bauxite.

An important technological development in the paper industry made this part of the South an ideal location for large paper-making interests. This development was the perfection of the process of using southern pine wood pulp as a base for certain types of paper. Natural gas again was utilized as the fuel required to generate the large quantities of steam needed in this process.

The availability of natural gas in this territory also encouraged the enlargement of the cement industry where again the sintering of raw materials presented a load to be handled effectively by natural gas.

Power plants in this area had been fueled largely by coal from nearby deposits. As natural gas moved in, such plants were adapted to the use of both coal and gas giving protection against the interruption of fuel supply by labor disputes or transportation difficulties. The foregoing shows clearly how the replacement of a community's manufactured gas supply by natural gas not only aided the existing fuel consuming industries, but also attracted outside interests which have proven to be assets of high value.

In some areas approached by natural gas pipeline systems, it was not deemed economical and practicable to abandon manufactured gas facilities and use natural gas entirely. Large investment existed in gas plants which could not be retired from service without loss of earnings and consequent difficulty in financing the costs of changeover to the new fuel. Therefore, instead of using natural gas in its entirety, it was utilized as a replacement for enricher fuel. In some cases, blue gas was enriched to the heating value already existent; in others, the heating value was increased by producing a mixed gas of higher thermal content than had been previously distributed.

Advantages of Mixing

Mixed gas is a fuel that presents several advantages over manufactured gas. It renders unnecessary the handling and storage of large quantities of oil. Tars and light oils disappear and their attendant removal from the gas becomes unnecessary. Plant labor is somewhat reduced. However, certain manufacturing costs remain which keep the costs of mixed gas up to a point that make it prohibitive for use in large quantities such as would be required by the type of customers described as existing in the Mobile area.

Furthermore, even if the cost of mixed gas were comparable to other fuels, it would have been impossible for most gas companies to have produced mixed gas in quantities necessary for their prospective industrial customers without large plant additions for the purpose of making additional quantities of basic blue gas.

In many of these situations, local gas companies successfully worked out plans whereby local industry could participate in the use of natural gas. By reason of the location of more important industries in the service area, it was sometimes possible to isolate a part of the distribution system or build a new segment of the system for the use of natural gas only. In this manner, it was possible for the company to deliver mixed gas to its residential, commercial and light industrial cus-

Question:

Guess who'll tie the knot?

The parson, of course. And when it comes to buying their new range, she'll decide which type they get, too. It will be the range having modern improvements that make her cooking easier and better . . . a fact the gas industry can well ponder.

WHAT WE WANT

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WHAT SHE WANTS

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WHAT SHE FINDS

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QUESTION: The *performance* of the gas ranges in use will determine the extent to which gas is used for cooking in the future. Why not, then, equip *all* new gas ranges with Harper Center Simmer Burners?

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tomers and at the same time deliver natural gas to the other industries in quantities not limited by the manufactured gas facilities.

Thus far this discussion has been devoted generally to the use by industry of natural gas furnished by gas distribution companies who purchase their supply from the pipeline companies. In large centers of population, industrial plants are usually located within areas covered by franchises held by local operating companies, thereby giving them sole rights to this business but ordinarily subject to state control as to rates and service. Many natural gas pipeline companies prefer to have all such gas sold by distributing companies. This method relieves the pipeline company of rendering local and individual service to customers whose service requirements vary with every type of use. It also removes the possibility of undesirable competition between the pipeline company and local distributors of natural gas.

Direct Sales

However, all the industrial gas sold in this country is not sold through such agencies. There are instances where an industry itself has procured natural gas production in the area in which it is located. They have found it profitable to produce the gas and transport it to their plant. This has sometimes led to the formation of a company whose only function is the furnishing of natural gas to a group of industrial users. Companies of this kind are to be found throughout the gas producing areas of the country. In some cases, industry has arisen in natural gas producing areas merely because of the existence of gas. For instance, carbon black plants can be found in areas far removed from centers of population and industry. Natural gas for this purpose is usually not commercially acceptable in transmission pipeline markets because of high sulphur content, low heating value or not being economically transportable by reason of distance.

Thus far, only situations already served by natural gas have been discussed. Today plans have been formulated by certain natural gas pipeline companies to push their product to the northeastern part of our country. One company has received a certificate to transport natural gas from Texas to the populous area which includes New York City, northern New Jersey and Philadelphia. Another company is already delivering some natural gas into Philadelphia. One of the largest pipeline companies has declared its intention to build an extension of its system to New England.

These areas are now served with manufactured gas by some of the largest and best operated representatives of the gas industry. The results of pioneer research and operation in the manufacture of gas, coke and other by-products are to be found in this region. Here are some of the last remaining provinces of manufactured gas in the United States. This industry is beset by many problems. Gas making materials—oil, coal, and coke—are higher in price than ever before. Consequently, the investment in fuel stock piles is at a new high. Never has the cost of labor been so high. Labor disputes from time to time threaten to interrupt the supplies of necessary production fuel.

Cost Considerations

Every company has a backlog of potential customers whose demands will strain present plant and distribution facilities. In some cases, it is possible to take advantage of fuel clauses or to secure rate increases to offset part of the increased cost of manufacture. However, this transfer of part of the increased cost to the customer is not popular and leads to the investigation of competitive types of service. This is particularly true in the case of the industrial customer now served by these companies. There are many such customers, some of whom use large quantities for specialized processes.

It is quite likely that when natural gas is extended to the northeast area, the gas companies, particularly the larger ones, will use natural gas as the enriching agent in some form of mixed gas. Depending upon the adequacy of their distribution systems, they will either maintain existing heating value standards or increase them somewhat. At the present price of enriching oil, the cost of mixed gas should be decreased by the substitution of natural gas when purchased at prices offered by the pipeline companies.

Search for New Loads

If this decreased cost is reflected in the rates to the consumer, there will be an increased demand for house heating gas. An increase in this type of seasonable load will tend to reduce the company's annual load factor. Rates proposed to be charged by pipeline companies in the northeastern area are designed in a manner that will encourage the distributor to maintain a high annual load factor by reducing the average cost per Mcf. This will prompt a search for types of load that will tend to cancel the seasonal effect caused by the heating load. Naturally, attention will be given to existing industrial load. Most industry is located within areas covered by franchise of a distributing company. If the company confines itself to the distribution of only mixed gas, there will be a limit to the extent to which industrial load can be increased. All gas delivered will have to go through the plant as enrichment fuel and for this reason the resulting mixed gas will require a higher rate per therm than if it were not processed. There will be a limit to plant output of mixed gas unless plant facilities are enlarged.

These facts will lead the distributor to investigate the possibility of interesting potential sizable industries in the use of straight natural gas seasonably on an interruptible basis. Service of this type will necessitate sectionalizing or building a portion of the distribution system for conducting straight natural gas to such customers. Design of the existing system, location of the pipeline measuring stations and zoning of the city will, among other things, be factors in this accomplishment.

Combinations

As already stated, combination of mixed gas and straight natural gas distribution facilities has been worked out successfully by mixed gas distributors to the point where large industrial customers can use straight natural gas for their processes. There will, no doubt, be some gas companies in the Northeast that will choose to change to a complete use of natural gas and convert their water gas plants to the manufacture of standby gas of calorific value comparable to natural gas. Their approach to the assumption of industrial load can be somewhat clearer than the approach of the company which chooses primarily to distribute mixed gas. Particularly, the isolation of any part of the distribution system will not be found necessary.

There is an element of price stability that is reflected in the costs of natural gas to the ultimate industrial consumer. Natural gas that is secured in the field by pipeline companies is usually contracted for on the basis of fixed prices agreed upon for as long as 20 years. The earnings of these companies are regulated by the Federal Power Commission which, accordingly, fixes the rates charged to the distributor. These rates, in turn, determine the distributor's cost of gas, a large item in operating expenses, which is quite stable because of the effect of controlled earnings. This same element persists when the gas is sold to the industrial customer as the distributor is also subject to control of earnings and rates by some local authority. It can be seen that these costs are not subject to demand and supply, seasons of the year and other factors that affect sharply the prices of other types of fuel.

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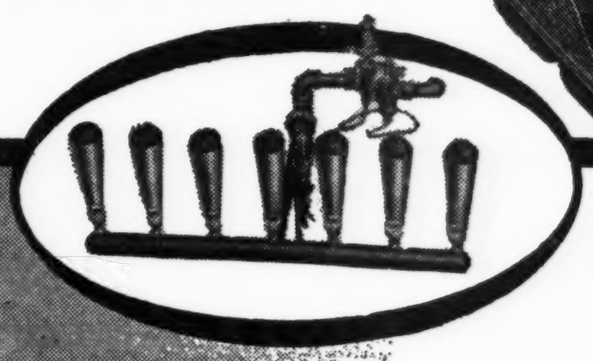

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Committeemen Plan Programs for 1949 Sectional Conferences

METALS COMMITTEE SESSION. Seated, from left, A. F. Pfetzing, Cincinnati; R. L. Melaney, Pittsburgh; S. F. Olinger, Cincy; A. M. Thurston, Cleveland; Carl Wierum, chairman, Brooklyn; M. Combs, AGA; S. P. Rodgers, Baltimore; E. J. Funk, Baltimore; R. E. Crane, Elizabeth. Standing, K. I. Robinson, Newark; E. B. Freeman, Muncie; J. E. Pittinger, Philly; E. L. Woods, Springfield; H. A. Clark, Detroit.

PROGRAM AND PAPERS COMMITTEE MEETING. From left, John J. Bourke, AGA; F. T. Brooks, Philadelphia Electric Co.; A. D. Wilcox, Eclipse Fuel, Rockford, Ill.; J. A. Rockefeller, Newark; L. E. Biemiller, chairman, Consolidated, Baltimore; Carl H. Lekberg, Hammond, Ind.; M. A. Combs, AGA; E. V. Fineran, Washington Gas Light. Chief item of business: Sales Conference on Commercial and Industrial Gas.

WINTER means work for association committees. No exception to this rule, the men-behind-the-scenes in the AGA Industrial and Commercial Gas Section have been busy for the past few weeks lining up projects and conference programs for 1949.

Top billing on the agenda, the event that much of the early spade-work is pointed toward, is the 1949 Sales Conference on Industrial and Commercial Gas, to be held this year at the Andrew Jackson hotel, Nashville, Tenn., April 5-7. Plans for this session were roughed out at a recent meeting of the program and papers committee of the section, under the chairmanship of L. E. Biemiller of the Consolidated Gas Electric Light & Power Co., Baltimore.

A three-day conference was outlined, with a "Commercial Gas Day," a half-day general session during the morning of the second day and parallel symposia in the afternoon, and an "Industrial Gas Day" in that order.

Five subjects have been lined up for Commercial Gas Day. A water heating panel is scheduled for the opening spot, with developments in storageless water heating and simplified sizing for restaurant water heaters and dishwashers included. A report on an investigation of gas and electric commercial kitchens will be followed by a talk on diversifying commercial sales to include all opportunities for the sale of commercial gas other than for kitchens. Modern gas ovens for the retail bake shop is another important item on the program, with a report on trends in school kitchens the final report of the session. This latter subject will be slanted toward the requirements of school food service directors.

Five topics are being arranged for the general session. These will include fundamentals of selling, selling quality performance vs. price consciousness; a discussion of one phase of selling the food market; an industrial symposium on high speed heating and galvanizing; and, finally, a commercial symposium on servicing, from the viewpoint of the commercial sales department official, a manufacturers representative, and the service superintendent. Concurrently, another symposium will be held, this on the subject of methods used in selling commercial equipment.

ASSOCIATIONS

On industrial gas day, reports on research tests on radiant gas burners, the surge method of paint drying, using gas to speed up production in processing in the textile and paper industries, gas atmospheres in the paint, varnish, and chemical industries, modern core baking ovens, and protective devices will be given.

* * *

Other committees of the section, meeting in recent weeks, have set up important studies for 1949. The metals committee, under chairmanship of Carl Wierum, plans to investigate stereotype metal melting and low temperature metal melting in general, galvanizing, the fundamentals of heat treatment, and the fields of magnesium and aluminum. The food service equipment committee, headed by James V. Hall, will give more intensive effort to the protection of the commercial cooking load against competition, investigating particularly the adequate servicing of appliances as a means to this end.

The commercial processing committee, under L. J. Fretwell, will spread the bulk of its labors over the sujects of volume water heating in breweries and laundries, commercial air conditioning in the 25-50-ton capacity range, steam generation with recommended gas conversion equipment, and steam boilers, for small steam pressing and cleaning shops.

Other committees will carry on in the main with projects already in the mill.

Convention Planners

The fate of the 1949 convention of the American Gas Assn. rests in the hands of nine men, led by George F. Mitchell, president, The Peoples Gas Light & Coke Co., Chicago, President Robert Hendee of the AGA has announced. In listing selections for the convention committee, Mr. Hendee predicted another smashing success.

Mr. Mitchell will be assisted by F. X. Mettenet, vice president of Peoples Gas, who will direct overall arrangements in his capacity as vice president. Others comprising the committee include:

Leroy M. Edwards, vice president, Pacific Lighting Corp., Los Angeles; F. L. Fairchild, president, Sprague Meter Co., Bridgeport, Conn.; Ralph L. Fletcher, president, Providence (R.I.) Gas Co.; N. Henry Gellert, president, Seattle Gas Co.; W. H. Ligon, president, Nashville (Tenn.) Gas & Heating Co.; J. French Robinson, president, The East Ohio Gas Co., Cleveland; and A. H. Weyland, president and general manager, Arkansas Natural Gas Co., Shreveport, La.

The convention is scheduled to go west to Chicago this year. The dates: Oct. 17-20.

PCGA in Action

The Pacific Coast Gas Assn., which concentrates its sectional activities in the winter and early spring months, has swung into an intensive schedule of meetings, conferences and round tables.

Opening the season, a payroll accounting meeting was held in Santa Cruz, Calif., Dec. 9 and 10, under chairmanship of E. C. Bruce. Following this, the commercial group of the sales section held a Commercial Cooking conference at the Southern California Gas Co. in Los Angeles Jan. 13. Otto Ketelsen, San Diego Gas & Electric Co., sponsored the one-day meeting. From the southern end of the state, attention was shifted later in the month to San Francisco and the Pacific Gas & Electric Co., where W. S. Hyde sponsored an accident prevention meeting Jan. 20-21.

Five conclaves are lined up for February. These include the Domestic Research Conference, arranged jointly by the AGA and PCGA, and scheduled for the Ambassador hotel in Los Angeles, Feb. 3 and 4; the Internal Audits session of the accounting section, under chairmanship of W. D. Chambers, at San Diego Feb. 10 and 11; the Industrial Sales meeting, headed by W. D. Howell in San Francisco Feb. 10-11; a home service meeting sponsored by Maxine Howe in Los Angeles Feb. 17-19; and Dan L.

Turner's Sales Training meeting in Los Angeles Feb. 25.

Others on the agenda for future months:

March 3-4: Customer Service, San Francisco, N. H. Gellert Jr.

March 10-11: Domestic Sales, Los Angeles, J. L. Hall.

March 23-25: Customers Accounting, San Francisco, C. L. Kasten.

April 7-8: Distribution, Los Angeles, S. A. Bradfield.

April 28-29: Technical Services, Los Angeles, Guy Corfield.

May 5-6: General Sales Conference, Los Angeles, F. S. Parmenter.

May 19-20: Transmission, San Francisco, Ralph Nabors.

May 18-20: General Accounting, Los Angeles, A. J. Gudgell.

June: Northwest Conference, Seattle.

Operations in NEGA

More than 200 attended the meeting of the Operating Division of the New England Gas Assn. in the Hotel Statler, Boston, on Thursday, Jan. 13, again setting a record for the division.

Five papers and a motion picture brought those in attendance up-to-the-minute information on new developments in operating practice in New England and elsewhere. As usual, many attended from outside the area.

The following 1949-50 Operating Division officers and directors were elected:

Chairman, George C. Pearl, Connecticut Light and Power Co., Norwalk; vice chairman, E. F. Kennedy, Malden (Mass.) and Melrose Gas Light Co.; secretary-treasurer, Donald Whitcomb, Providence, R. I.

Directors: E. R. Clark, Lynn (Mass.) Gas and Electric Co.; R. B. Barger, The Hartford (Conn.) Gas Co.; H. C. Jones, New England Power, Boston; E. C. Rhodes, New Britain (Conn.) Gas Light Co.; C. R. Prichard Jr., Gas Service, Inc., Nashua, N. H.; C. F. Machen, Boston Consolidated Gas Co.

The meeting opened with an outstanding color motion picture of distribution practices at Providence under direction of Donald Whitcomb. Edward G. Boyer, manager of the gas department of Philadelphia Electric Co., discussed the application of catalytic cracking to the gas industry. A paper prepared by Orie Van Rye, New England Power, took a broad view of the operating man's responsibility for employee and public relations. Warren E. Churchill, chief chemist of Boston Consolidated Gas Co., discussed plant operation in relation to utilization.

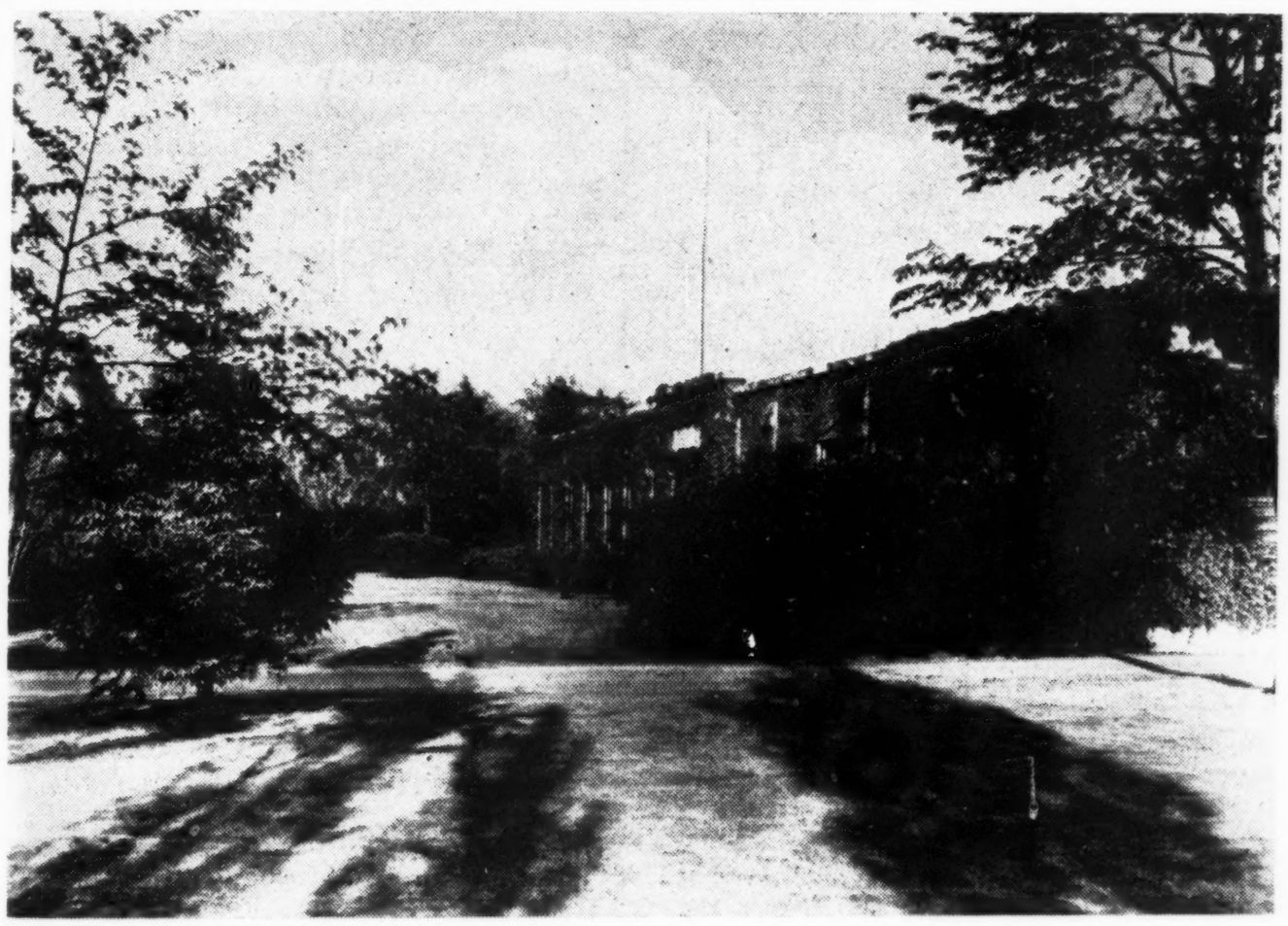
OUA Elects

New officers of the Oklahoma Utilities Assn. for 1949 have been announced by Secretary Kate A. Niblack as follows:

Malcolm Morrison, Oklahoma Gas and Electric Co., Oklahoma City, president; D. W. Reeves, Oklahoma Natural Gas Co., Tulsa, first vice president; C. N. Robinson, Public Service Co. of Oklahoma, Tulsa, second vice president; H. H. Ferrin, Oklahoma Gas & Electric Co., Oklahoma City, treasurer; Miss Niblack, Oklahoma City, secretary.

Directors: D. S. Kennedy, C. B. Day, Malcolm Morrison, and E. C. Joullian, all of Oklahoma City; L. A. Farmer, Ponca City; D. W. Reeves and R. K. Lane, both of Tulsa; J. Y. Wheeler, Ardmore; W. L. Woodward, Alva; S. I. McElhoes, Chickasha; W. R. Thomas, Ada, and A. F. Potter, Bartlesville.

The 1949 annual convention will be held at the Tulsa hotel March 17 and 18. The convention committee met in January.



The M. B. Skinner Co. has just finished its 50th year of furnishing specialized pipe repair clamps and allied products to American industry.

The company was established in Chicago, but has been headquartered in South Bend at the plant shown above for the last 20 years. Its history includes several items of note: no strikes or work stoppages since its founding, pioneering in profit-sharing, and an average length of service of 12 years for all employees.

Buyers to Chicago

National defense, standardization, and the operating man's viewpoint, as they affect the public utility buyer, head up the program of topics for the 18th annual midwinter conference of the Public Utility Buyers Group of the National Assn. of Purchasing Agents, to be held this month—Feb. 7-8—at the Edgewater Beach hotel in Chicago.

Selected to speak on these subjects, according to an announcement by George H. Cole, Alabama Power Co., Birmingham, chairman of the group, are Edward Falck, utility expert of the National Security Resources Board, William C. Johnson of Allis-Chalmers, and S. M. Dean, Detroit Edison Co. Horace L. Brewer, purchasing agent for Consumers Power Co., Jackson, Mich., is also scheduled to talk.

Canadian Cooperation

A strengthening of inter-association cooperation within the Canadian gas industry has been accomplished with the recent affiliation of the Natural Gas and Petroleum Assn. of Canada with the Canadian Gas Assn., the recognized national organization of the dominion.

The move was in no way a consolidation, the natural gas group retaining its identity, but was rather a step toward buttressing the industry's position in matters of policy.

Four other bodies were already affiliated with the CGA, including the International Gas Union, the National Gas Assn. of Australia, the Western Canada Petroleum Assn., and the AGA, according to George W. Allen, CGA secretary.

Accounting Ideas

Accounting departments in utility companies will at last be able to obtain up-to-date information on what other companies in the industry are doing, through the medium of a bulletin program recently put into effect.

The accounting sections of the AGA and the Edison Electric Institute, which are famous for their cooperative efforts, are joint sponsors of the project. Titled "Accounting Developments Service Bulletins," the publications will be distributed periodically to all member companies of both associations.

Material is gathered from member companies themselves and is submitted to a joint committee, where it is screened. In this way, the best ideas originating in one company are given nation-wide publicity.

NACE Plans Show

Symposia on Corrosion Principles, Cathodic Protection, Chemical Industry, Communications and Electrical Industries, Gas Industry, General Industry, Oil Industry, Protective Coatings, Pulp and Paper Industry, Salt Water Corrosion, and Transportation Industry, with papers by authorities in these fields, are programmed for the fifth annual conference and exhibition of the National Assn. of Corrosion Engineers, to be held April 11-14 at the Netherlands Plaza hotel in Cincinnati.

The exhibition, with displays by various manufacturers, will show the latest methods, materials, equipment and services for combatting corrosion.

EXPANSION

Tennessee Gas

Expansion hearings hang on gas supply contracts

Tennessee Gas Transmission's expansion program is still hanging fire. The company asked the FPC late last December to hold up hearings on its application to construct additional natural gas transmission facilities until it had concluded additional gas supply contracts. It asked that hearings be set for April, 1949.

The FPC, however, left the date indefinite to permit reconvening the hearing before April "if future developments warrant."

Tennessee's last okay by the FPC was on Dec. 7, when permission to build lines and compressor facilities to service Manufacturers Light and Heat Co. (Pittsburgh) with 111 MMcf per day was granted. At that time the FPC deferred action on the other aspects of the company's application until a satisfactory supply for the company could be shown.

Pending authorization now are a 395-mile 26-in. line from northeastern Kentucky to the vicinity of Buffalo, 909 miles of second and third loops along the existing main line, and additional compressor units. The whole works will boost Tennessee's capacity by 340 MMcf daily, and cost almost $123 million.

Pittsburgh Group

Three members of the Pittsburgh Group of the Columbia Gas System Inc.—Manufacturers Light and Heat Co., Home Gas Co., and Natural Gas Co. of West Virginia—have been authorized by the FPC to make some changes in their systems, with an eye for greater efficiency and flexibility in operations.

Manufacturers will construct about 10 miles of 12-in. pipeline from a line near Canonsburg, to the Pittsburgh area; about five miles of 6-in. line in Ohio, from Steubenville to Wintersville; and compressor facilities. The company will abandon and/or sell certain compressor facilities and pipeline in West Virginia and Pennsylvania.

Home Gas will acquire the Dundee compressor station and storage field in New York from its affiliate, the Keystone Gas Co. Inc.

Natural Gas will construct approximately five miles of 8-in. line.

Estimated total net cost of the whole project is $888,924.

Line to San Diego

A line extending from the Biggest Inch to San Diego is under consideration by the FPC. San Diego Gas and Electric Co. has sought authorization to construct and operate about 50 miles of pipeline as part of an 85-mile line from Moreno, Calif. Southern Counties Gas Co. is to construct the other section, and has filed an application with the FPC, as reported last month.

San Diego's application said that its part of the proposed 16-in. line would cost approximately $3,037,000. The company proposes to finance the line with funds on hand, sale of bonds and equity securities, and if necessary, bank loans.

The line would increase deliveries from Southern Counties by approximately 37 MMcf per day. San Diego now receives 33 MMcf from SoCounties. The two lines would connect at Rainbow, in San Diego county.

Hugoton-Hutchinson

The Kansas Power & Light Co., Topeka, has announced that pending completion of a $7 million expansion program during 1949, it has made a temporary contract with the Cities Service Gas Co. to tap its new 26-in. line extending from the Hugoton gas field near Ulysses to Hutchinson, Kan., for a supplemental supply of gas during the present year. The connection will be made near Hutchinson.

This arrangement will give Salina and 100 other Kansas cities and towns on the Kansas Power & Light Co. lines a sufficient amount of gas to take care of customers' requirements pending completion of a 20-in. gas line to be constructed by KP&L to the Hugoton field.

The new line will extend from the latter company's main system at Pratt, Kan., a distance of 145 miles, to the Hugoton field. The improvement will include a 4500-hp compressor station. The line and station are expected to be completed by Nov. 1, 1949.

Expansion Briefs

A roundup of other expansions moves around the United States:

Richmond (Va.) Department of Public Utilities began installation last month of a new $25,000 scrubber at the city gas works. Officials of the public utility stated that the one scrubber in operation hadn't been able to take care of the current load; some users had been complaining of jet-clogging gum forming in their gas-burning equipment.

Michigan Gas Storage Co., Jackson, Mich., a subsidiary of Consumers Power Co., has announced the beginning of construction of a 120-mile pipeline which will start near Chelsea, Mich., and connect with the system near Mt. Pleasant.

Completion of the $3½ million project is scheduled by next June. The E. J. Mahoney Co. of Mt. Pleasant has been awarded the construction contract.

Delaware Power & Light Co. has announced the authorization of more than $½ million for the maintenance, expansion, and extension of gas facilities in the Wilmington area, as a part of its postwar expansion program.

Delaware Power's 1949 program for the improvement and extension of its facilities on the Delmarva peninsula calls for the expenditure of more than $18 million.

Hartoise Scores

Ever seen a HARTOISE?
A REPORT OF OUR PROGRESS in Bringing More Natural Gas to Our Customers
THE PEOPLES NATURAL GAS COMPANY
SERVING HOMES AND INDUSTRIES IN WESTERN PENNSYLVANIA

A new animal, the "Hartoise" has been created for the advertising of The Peoples Natural Gas Co., which serves homes and important industries in Pittsburgh and neighboring communities in western Pennsylvania.

The animal, a cross between a hare and a tortoise, is an imaginary creature. It has a rabbit's face and ears, and the front legs and shell of a tortoise. It is pictured in the ad, and the company explains the animal reminds them of their own experiences in their race to complete their $19,900,000 expansion program.

"Like the hare," the company states in its accompanying advertising copy, "we've sped ahead whenever pipe and other materials have been obtained. And like the tortoise, we've kept at it tenaciously, never giving in to the temptation to take it easy, as did the hare.

"And so—moving by leaps and lags—we have succeeded in maintaining a good average speed, as the following report indicates, in spite of the barriers raised by war-caused pipe and materials shortages."

The company lists the following points in its report of progress:

We've laid 260,000 ft of transmission pipelines.

We've laid 507,000 ft of distribution pipelines.

We've built three new compressor stations of 6800 hp.

We've increased our storage capacity.

We've drilled 109 new wells.

We've contracted for daily deliveries of millions of cubic feet of additional southwestern gas.

In concluding paragraphs, the company points out that the many uncertainties regarding supply of materials and pipe prevent them from accurately forecasting future progress. With adequate supplies, they state, they can complete their $19,900,000 expansion program by the scheduled date—Dec. 31, 1949.

Copy for this advertisement was prepared by Ketchum, MacLeod & Grove Inc. of Pittsburgh.

FINANCIAL

Rate Roundup

Action in rate changes centered in New York this month, with the Public Service Commission making a number of major changes in rate schedules on an interim period basis. In Florida, Jacksonville Gas Corp.'s fight against a city council rate reduction went to the state Railroad and Public Utilities Commission. The issue there—as it is over most of the United States—is based on the valuation of assets by governmental bodies and their ideas of what constitutes a fair profit.

Kings County Lighting Co. has received authority from the New York Public Service Commission to file new tariff schedules which would bring in about $376,500 a year. The company had requested an increase which would have added $415,000 to its income annually.

Among other specifications, Kings County asked for a boost of 7 cents in the monthly minimum charge; the commission granted a 4-cent boost, making the minimum $1.12. The company, which serves approximately 114,000 customers in Brooklyn, will have an operating income of about $500,000 under the new rates, granting them a return on their $9,667,602 investment of about 5%.

The new rates go into effect on five days' notice on an interim period basis to end next June 30.

Iroquois Gas Corp., Buffalo, has been authorized to boost its rates in its home city and adjacent communities to bring in an estimated $1,671,000 annually. The New York Public Service Commission also announced that no additional higher rates would be allowed the corporation until "it has demonstrated its ability to render complete, adequate service and until the reasonableness of the price it pays for natural gas from out-of-state sources is established."

Most all-purpose users in the area will find an increase of 5 cents per Mcf in their monthly bills, with residential and commercial rates that cover house or water heating service upped 10 cents per Mcf.

Jacksonville (Fla.) Gas Corp. still hadn't heard—as *GAS* goes to press—from the State Railroad and Public Utilities Commission regarding the lowering of the company's rates by the Jacksonville city commission. Jan. 1 was the date when rates were to be dropped, but a temporary injunction was granted by Federal Judge Dozier A. DeVane, the injunction to hold until final legal rates have been fixed.

The judge also instructed the company to record its charges to consumers starting Jan. 1; in case the lower rates are deemed legal a refund will have to be made. Bond of $100,000 was posted.

Jacksonville Gas holds that its valuation should be set at $5,487,000 and that the company is entitled to an 8% return on its investment. The city commission set the company's valuation at $2,395,000 and granted it a 6.5% return on that amount.

Southern Gas and Electric Co., Bradenton, Fla., received an approximate 10% gas rate increase to begin Jan. 1, from the city council. Action followed an appeal brought

Calendar

February

AGA-PCGA Domestic Research Conference—Ambassador hotel, Los Angeles, Feb. 3-4.

March

National Assn. of Corrosion Engineers Annual Convention — Cincinnati, Ohio, March 7-10.

AGA Residential Gas Section, Eastern Natural Gas Regional Sales Conference — William Penn hotel, Pittsburgh, March 14-15.

Oklahoma Utilities Assn. Annual Meeting—Tulsa hotel, Tulsa, Okla., March 17-18.

New England Gas Assn. — Hotel Statler, Boston, March 24-25.

AGA Domestic Research and Utilization Conference—Hotel Statler, Cleveland, Ohio, March 24-25.

Annual Safety Convention & Exposition—Hotel Pennsylvania, New York, March 29-April 1.

Mid-West Regional Gas Sales Conference—Edgewater Beach hotel, Chicago, March 28-30.

April

Industrial Accident Prevention Assn. Convention—Royal York hotel, Toronto, April 4-5.

Distribution, Motor Vehicle & Corrosion Conference—Netherlands Plaza hotel, Cincinnati, April 4-6.

Gas Appliance Manufacturers Assn. Annual Meeting—Broadmoor hotel, Colorado Springs, April 5-7.

AGA Sales Conference on Industrial and Commercial Gas—Andrew Jackson hotel, Nashville, April 5-7.

Gas Meters Assn. of Florida-Georgia Annual Meeting—Ponce de Leon hotel, St. Augustine, Fla., April 10-12.

Mid-West Gas Assn. Annual Convention — Hotel Fort Des Moines, Des Moines, Iowa, April 11-13.

National Assn. of Corrosion Engineers — Netherlands-Plaza hotel, Cincinnati, April 11-13.

AGA-EEI Spring Accounting Conference — Hotel Book - Cadillac, Detroit, Mich., April 11-13.

Southwestern Gas Measurement Short Course — University of Oklahoma, April 12-14.

Midwest Power Conference—Hotel Sherman, Chicago, Ill., April 18-20.

Southern Gas Assn. Annual Convention—Buena Vista hotel, Biloxi, Miss., April 20-22.

The Maryland Utilities Assn. Annual Meeting—Lord Baltimore hotel, Baltimore, April 22.

Indiana Gas Assn. Convention—French Lick Springs hotel, French Lick, Ind., April 28-29.

May

AGA Natural Gas Department Spring Meeting — French Lick Springs, Ind., May 9-10.

LPGA Annual Convention—Palmer House, Chicago, May 9-11.

AGA Industrial Gas School—Hotel Severin, Indianapolis, Ind., May 9-13.

AGA Executive Conference—Netherlands Plaza hotel, Cincinnati, May 12-13.

National Fire Protection Assn.—Fairmont hotel, San Francisco, May 16-19.

Pennsylvania Gas Assn., Annual Convention—Galen Hall, Wernersville, May 17-19.

AGA Production & Chemical Conference — Hotel New Yorker, New York, N. Y., May 23-25.

National Restaurant Exposition—Atlantic City, N. J., May 24-27.

Pacific Coast Domestic Research and Utilization Conference — Ambassador hotel, Los Angeles, May 26-27.

The Natural Gas & Petroleum Assn. of Canada Annual Meeting—Hotel London, London, Ont., May 26-27.

National Assn. of Master Plumbers—Annual Convention & Home Comfort Exposition, Cleveland Public auditorium, Cleveland, Ohio, May 30-June 2.

June

Canadian Gas Assn. Annual Convention—Bigwin Inn, Lake of Bays, Ontario, June 16-20.

New York-New Jersey Regional Gas Sales Conference — Essex & Sussex hotel, Spring Lake, N. Y., June 20-21.

Michigan Gas Assn. Annual Convention — Grand hotel, Mackinac Island, Mich., June 24-25.

September

Pacific Coast Gas Assn. Annual Convention—Santa Barbara, Calif., Sept. 7-9.

The Maryland Utilities Assn. Fall Conference—Cavalier hotel, Virginia Beach, Va., Sept. 16-17.

National Butane-Propane Assn.—Jefferson hotel, St. Louis, Sept. 19-21.

October

American Gas Assn. Annual Convention—Chicago, Oct. 17-20.

National Safety Congress—Morris hotel, Chicago, Oct. 31-Nov. 4.

before the council by company officials who cited increased operating expenses. One company official noted that the rate under the increase would still be lower than it was in 1939 before rates were voluntarily reduced.

Long Island Lighting Co., Queensborough Gas & Electric Co. and *Nassau & Suffolk Lighting Co.* (N. Y.) petitioned the Public Service Commisison for further increased gas rates as hearings on the present charges were still underway. The additions would bring in approximately $\$\frac{3}{4}$ million.

The commission has been investigating current interim rates which will expire Feb. 2 and are designed to bring in about $\$2\frac{1}{4}$ million of additional revenue.

Consolidated Edison Co. of New York has received a one-year interim period gas rate increase which will total almost $\$11\frac{1}{2}$ million, but at the same time the New York Public Service Commission knocked down electricity rates by a flat 10%. Estimated loss: $\$22\frac{1}{2}$ million.

In the opinion of Milo R. Maltbie, ConEd was making an excessive profit on its electric service. ConEd's president, Ralph H. Tapscott, said in rebuttal that wage raises and expansion costs (the company is to spend $250 million in the next 4 years for wages and material in building additional plant in New York) have increased the company's debt, and that "a rate decrease at this time will make the company's problem of getting new money for plant expansion extremely difficult. . . . The order infers that the company should either fail to provide for the public's needs or should go dangerously into debt to do it."

The gas increases take many forms, among them: (1) A minimum charge of $1 per month (from 58 cents). (2) Customers who do not use gas for heating had the rate for 2500 cu ft raised from $2.88 to $3.50. (3) Home-heating customers had their rate for 25 Mcf upped from $15.95 to $22.60. (4) Commercial users who had been paying $19.95 for 25 Mcf in the summer and $28.75 in the winter will now pay a flat rate of $26.55. The company had asked for a boost to $26.10 in the latter case.

Texas Gas Sells Bonds

Texas Gas Transmission Corp. has sold $60 million of long-term bonds to a group of major insurance companies, the money to be used in financing Texas Gas' proposed 800-mile Texas-to-Ohio pipeline. The sale was made Dec. 23; funds will be available to Texas Gas on receipt of a certificate of public convenience and necessity from the FPC. As *GAS* went to press, hearings in Washington were still in progress.

Texas Gas has also entered into a standby loan agreement with the Chase National Bank of New York City, the Chemical Bank and Trust Co., and the Bank of Manhattan Co. for a standby loan agreement under which $\$7\frac{1}{2}$ million can be made available to finance construction.

The proposed line, expected to be in operation this next winter, will extend from the Carthage fields to a point near Middletown, Ohio, and will cost $73.5 million. A 63-mile section south of Memphis was previously authorized by the FPC and is now completed.

A warehouse and offices make up the new direct factory branch in Los Angeles of the Detroit Brass & Malleable Works. New facilities of the company, which manufactures machined brass castings and forgings for the gas industry, are located at 2456 E. 8th St.

Ray L. O'Brien, Detroit's president, has appointed W. A. Longobardi as branch manager.

Jersey Awaits Natural

Jersey Central Power & Light Co. is in the process of financing its Long Branch-New Brunswick pipeline, now under construction for use in the transmission of natural gas which is to be piped into New Jersey soon. The state public utilities commission recently heard the company's request to execute a first supplemental indenture and an issue of $\$3\frac{1}{2}$ million worth of first mortgage bonds, to be due in 1978.

Proceeds from the bond issue would be used to pay in part for new construction subsequent to last Oct. 1, according to a company official.

* * *

Meanwhile, the South Jersey Gas Co., Atlantic City, is preparing to spend $2 million on pipelines to take 6.5 MMcf of gas from Texas Eastern for distribution in Glassboro and Atlantic City as soon as the FPC has approved South Jersey's petition. FPC's staff has recommended that the application be granted. South Jersey's management plans to use earnings to help finance the cost of the program.

Gettysburg Absorbed

Jan. 1 saw the transferral of the natural gas service, properties, and other assets of the Gettysburg Gas Corp. to The Manufacturers Light and Heat Co., an associated company in the Pittsburgh Group of the Columbia Gas System Inc.

Gettysburg, acquired by Columbia in 1930, supplied gas to about 4500 customers in the Pennsylvania counties of Adams and Franklin. Dissolution of the corporation reduces the number of associated gas companies forming the Pittsburgh Group from eight to seven.

There will be no change in personnel, rates, or operations.

November Sales Up 15%

The AGA has reported that sales to ultimate consumers in November totaled 2,746,606,000 therms, a 15% gain over last year's November figure. The 12-month period ending Nov. 30 saw sales amount to more than 32 billion therms, a 10.5% increase.

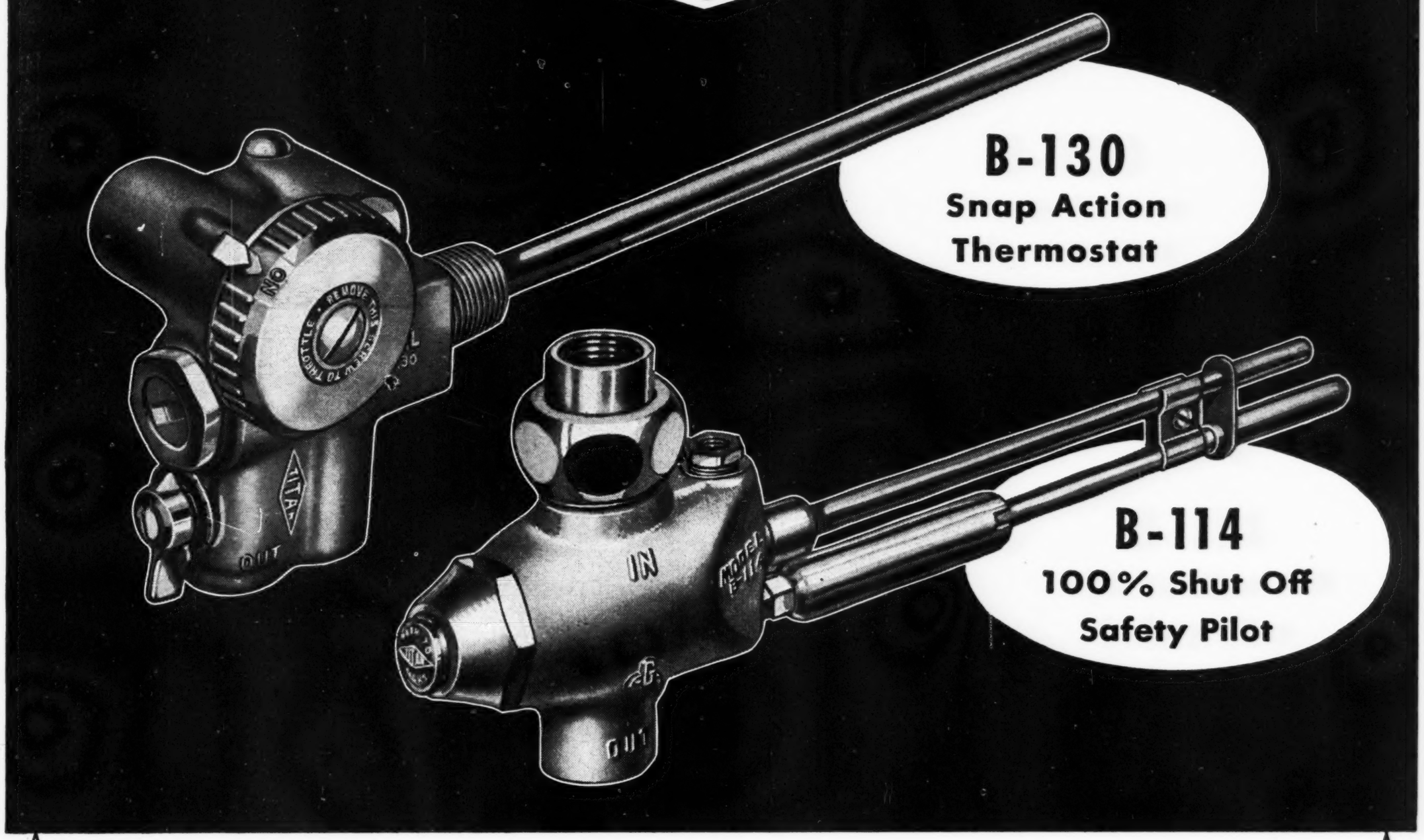
Manufactured gas sales gained 0.9% in November; last year's total was 191,544,000 therms. Natural gas sales for the month jumped 17.9% to total almost 2½ billion therms. Mixed gas sales sank 16.1%, to a total of 91,704,000 therms.

United Dissolving

United Public Utilities Corp. underwent further dissolution in federal district court in Wilmington, Del., at the close of the year. Judge Paul Leahy approved a supplement of the dissolution plan which proposed the sale of all United holdings in its remaining subsidiary companies to the Ohio Valley Gas Corp. for $700,000.

United holdings constitute all of the outstanding securities of such subsidiary com-

TWO NEW TITAN PRODUCTS



In accordance with the Titan Reputation for manufacturing the most up-to-date Control Equipment we present these two new TITAN PRODUCTS for your careful consideration.

TITAN B-114

100% Shut Off Safety Pilot
AGA Listed for Natural, Manufactured and L.P.G. Gases

This new Titan Product is a direct action, self-contained unit operating on a new permanent magnet actuating principle. Rugged construction. Valve and actuating mechanism can be removed as a unit for cleaning.

TITAN B-130

Snap Action Thermostat
AGA Listed for All Gases

This improved Snap Action Thermostat has a built-in, replaceable filter—is precision built to close specifications. Like all Titan Products it is designed and manufactured for long, trouble-free service.

Write for data sheets on both of these new TITAN CONTROLS.

THE TITAN VALVE and MANUFACTURING COMPANY
9913 ELK AVE., • CLEVELAND 8, OHIO

panies except for a small block of Peoples Service Co.'s common stock. Three Indiana gas utilities—Peoples Service Co., Indiana-Ohio Public Service Co. and Lunn Natural Gas Co.—are the last of United's subsidiary holdings.

Boston Sells Building

The main office building of Boston Consolidated Gas Co. has been sold to the John Hancock Mutual Life Insurance Co. for $2 million. Proceeds from the sale, after taxes, will be applied to the retirement of short-term notes now outstanding in the amount of $3,950,000.

The company, a subsidiary of Eastern Gas & Fuel Associates, has leased the property for 30 years, with an option of renewal for an additional 20 years or less.

Reliance Regulator Change

The Reliance Regulator Corp., Alhambra, Calif., has been taken over by its parent company, American Meter Co. Inc., according to J. J. Delaney, manager.

Hereafter the name of the firm will be the Reliance Regulator Division of American Meter Co. Inc.

GAS PRODUCTION

Alberta Gas

Northwest's line hinges on supply

COUNSEL for the Northwest Natural Gas Co., New York, which is seeking permission to export natural gas from the Canadian province of Alberta to the United States Northwest, pointed out some of the benefits accruing from its plan at a session of the Alberta natural gas commission in Edmonton in January.

W. E. Simpson, Edmonton lawyer representing the company, said that surveys in the United States have shown that exportation of gas leads to a sharp increase in the gas reserves of any producing area because of more wells being drilled. Then Mr. Simpson took up the matter of direct monetary advantages.

He said that if the company is given approval for plans to build a pipeline to the Pacific Northwest, it would mean on completion that the company would spend more than $1.2 million yearly in Alberta on salaries and wages.

On top of this, the company would pay $175,864,000 for gas now in the ground in the next 25 years of operation. The government of Alberta, he noted, would benefit by the collection of $500,000 a year in royalties.

Mr. Simpson's remarks came after submission of a brief by the Alberta branch of the Canadian Manufacturers' Assn. opposing approval of export plans. The CMA branch brief recomended that the proposal to export gas be shelved for five to ten years before being considered.

Presented by A. J. Maure, chairman of the branch's provincial legislation committee, the brief said that "it should be established beyond all reasonable doubt that all Alberta communities could be served in-

definitely into the future" before export is allowed. The brief suggested that in 50 or 100 years Alberta's natural gas might be depleted for reasons as yet unforeseen.

The CMA branch submitted that industries which may establish themselves in Alberta in the future under a long-term expectation of cheap natural gas would not come if the possibility arises that a few years will see the end of it.

"Before agreeing to our natural gas being exported, we should like to see it proven that the Alberta fuel demand can never catch up with available supplies," the brief said.

The brief saw future chemical industries and present industrial users absorbing increasing amounts to the degree that it was impossible to predict future demand in Alberta.

It continued:

"It is much more reasonable that such potential industrial users come to Alberta to enjoy these benefits. It is reasonable after our conceivable needs have been guaranteed that distribution could be expanded to the other Canadian provinces, but once this product is exported internationally, it is virtually impossible to shut off the supply without creating ill-feeling that would result in international repercussions. This is to be avoided."

Mr. Simpson challenged and questioned Mr. Maure on a number of points in the brief. He declared the Northwest Natural Gas Co. is not asking Alberta to sell anything in short supply but "something that is a surplus." Mr. Simpson indicated his clients' views that the question of export hinged on whether there is an exportable surplus with due regard to Alberta requirements.

Northwest Natural also offered to transport additional natural gas into Calgary for distribution. The offer was made to the Calgary Gas Co., and to Northwest Utilities Ltd., of Edmonton, Alberta, in letters read into the hearing by Faison A. Dixon, New York, president of the Seattle company.

Mr. Dixon said the offer to transport additional gas to Calgary and other Alberta points for sale there was made to meet objections that export would reduce the province's reserves. He said the company would agree to pipe adequate supplies of gas to Calgary, Lethbridge, and Edmonton, and that this would save Alberta companies the expense of enlarging their present gathering system.

Meanwhile, Dr. George S. Hume, chief of the Geological Survey of Canada, has reported that a vigorous search in Alberta would find gas in amounts far exceeding those now proven and probable. Dr. Hume told Alberta's natural gas commission that present discoveries have been found during the search for oil, and that a full-scale hunt for gas would result in a boosting of Alberta's reserves. He also said that many gas sands in wells already drilled have not even been tested.

Northwest Natural's $100 million pipeline hinges on the commission's verdict.

Hot Dope

—from Shaft #5

A review of recent actions of the Federal Power Commission lends hope that opposition to the exploitation of the country's limited reserves of natural gas will in the future meet with more success. In the Trans-Continental case, Docket G-704, the commission refused to issue a certificate until the applicant had made a further showing of gas reserves. In the Tennessee case, Docket G-962, the commission ordered further hearings to permit the applicant to introduce further evidence of gas reserves, and also in that case the commission is requiring that the applicant show ability to meet demands for approximately 20 years.

In pending applications of Texas Gas and Texas Eastern the commission is scrutinizing reserve estimates much more closely than was customary in the past. It would appear that the commission is becoming more aware of the danger involved in squandering the limited reserves of this valuable resource.

Extract in full from National Coal Assn. Industry Bulletin *No. 2602, dated Dec. 24, 1948. Southern Building, Washington 5, DC.*

Acetylene from Gas

A process for manufacturing synthetic acetylene gas from natural gas was described to the annual southwest regional meeting of the American Chemical Society at Shreveport by Dr. Eugene P. Schoch, director of the bureau of industrial chemistry of the University of Texas. An important new market for the natural gas industry was foreseen.

Dr. Schoch's new process is based on the principle of the neon light and utilizes methane, converting it to acetylene by electrical current. Efficiency of the new technique is remarkably great, according to the scientist. One of the most important theoretical results attained as a result of his experiments is the low per cent of energy loss recorded, giving a basis for expecting liquid hydrocarbons to be produced from methane by electric discharge at a cost comparable with that of the Fischer-Tropsch process.

REGULATION

PG&E Hearings Start

On the last day in January further hearings by the FPC on the consolidated proceedings on applications from El Paso Natural Gas Co., San Juan Pipe Line Co. (El Paso), and Pacific Gas and Electric Co. (San Francisco) were started in San Francisco. The three companies want authorization to construct and operate a pipeline which would carry west Texas and New Mexico gas to northern and central California.

The projected setup, which will provide PG&E with 400 MMcf daily, calls for:

1. San Juan to purchase, transport, and sell to El Paso at a point near Needles, Calif., 150 MMcf daily from San Juan county, N.

M., via 451 miles of 24-in. pipeline; a 3300 hp main line compressor station; 121 miles of feeder and gathering lines; a 3000 hp field compressor station; and appurtenant facilities. Cost: $28 million.

2. El Paso to purchase 250 MMcf from the Permian Basin and build 192 miles of 30- and 26-in. pipeline looping the company's present 26-in. line from the Basin; about 95 miles of 24-in. line in Texas; about 102 miles of 26-in. and 17 miles of 30-in. line extending from El Paso's Gila compressor station in central Arizona to a junction with the proposed San Juan line; and 80,840 hp in compressor capacity and additional field lines and equipment. Cost: $52½ million.

3. PG&E to build 506 miles of 30-in. line from the El Paso point of sale (between Needles and Topock, Ariz.) to PG&E's terminal at Milpitas, in the Bay Area. Additional lateral lines and compressor stations with 67,056 hp will put the cost to PG&E someplace between $57 and $65 million.

In mid-January the FPC granted petitions of intervention to the National Military Establishment and the Atomic Energy Commission. The AEC is concerned with San Juan Basin reserves because of power and heating requirements for its Los Alamos and Sandia Base projects, now being enlarged.

A release from the FPC on the military-naval petition states how much gas was purchased from PG&E by the military and naval installations in California in 1947 and 1948 (7 billion cu ft and 7¼ billion cu ft) and then quotes: "For these and other reasons, your petitioner is concerned with the matters and things which affect the supply of natural gas to its installations in . . . California."

Panhandle Transfer

Joint request of Panhandle Eastern Pipe Line Co. and the FPC staff counsel brought about a postponement until Feb. 7 of the hearing concerned with the FPC's investigation of Panhandle's transfer of natural gas reserves to Hugoton Production Co. The hearing had been set for Jan. 24.

A week before the postponement was granted the U. S. Circuit Court in Philadelphia turned down the FPC's application for an injunction to restrain Panhandle from paying a dividend of 810,000 capital shares of Hugoton to its stockholders, thus upholding a lower court decree made by Judge Paul C. Leahy in Wilmington, Del., in late November. A temporary order restraining Panhandle from making the distribution and also restraining Hugoton from assigning any of the leases on 96,164 acres in Kansas which it had received as part payment from Panhandle, was continued to give the FPC an opportunity to ask the U. S. Supreme Court for a review of the case.

At the Feb. 7 hearing the FPC will consider Panhandle's obligations to continue devoting the reserves exclusively to public service in connection with its FPC-authorized facilities. These obligations may have been incurred when Panhandle presented the swapped leases in support of applications to the FPC for certificates of public convenience and necessity.

Concerning the application for injunction presented to the U. S. Circuit Court, Judge Herbert F. Goodrich said in part that the FPC's argument that it has authority to regulate leases "proves too much." And further, "If (the argument) prevailed, a gas company which had had commission action on its rate base could never sell an outworn truck nor an obsolete drilling machine without getting commission approval."

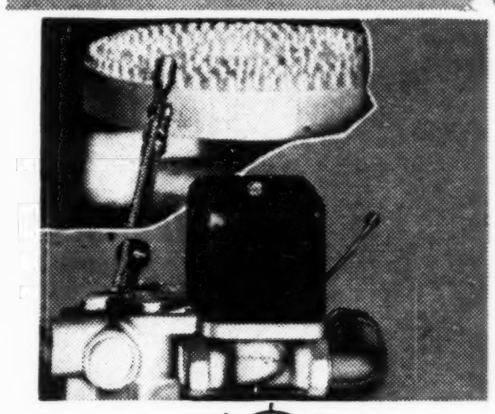
FPC's Hackles Up

A statement concerning rates of return on capital investments, which was attributed to H. Carl Wolf, managing director of the AGA, has drawn fire from the FPC. The FPC said, "Mr. Wolf's statement . . . carried the implication that natural gas companies are compelled to finance with debt securities because it is the only way a common stockholder could receive a fair return on his investment under the rates fixed by regulatory bodies.

The FPC denied that the rates of return it fixed forced natural gas companies to seek "cheap money" rather than "risk venture capital" through junior equity financing. In support, the commission published a survey of the financial condition of the companies subject to its regulation.

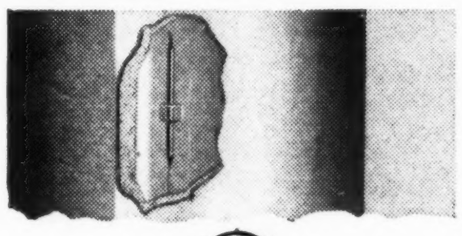
The survey covered 23 companies having an annual operating income of $1 million or more. Of the 23, 19 reported earnings on equity capital for 1947 of 10% or more, with the remaining companies having equity earnings of 9.1, 8.2, 5.2, and 4.9%. The FPC further reported on various companies' debt

New A-P DEPENDABLE Gas Controls
OFFER THESE BENEFITS TO
YOUR GAS-FIRED APPLIANCES...



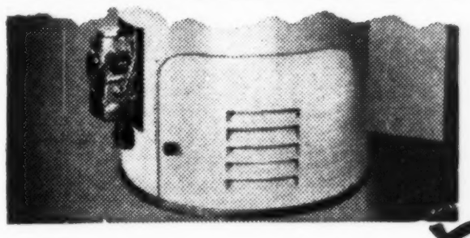
NEW GASAPACK FOR
FURNACES, HEATERS

A complete control unit for small furnaces and space heaters, Model 51, replaces four separate controls: hand cock, automatic pilot, motorized valve, and limit control. Saves control costs, assembly and installation expense. Available with Thermostat and Transformer. AGA listed.



NEW GASAPACK FOR
WATER HEATERS

This combination thermostatic valve and pilot assembly provides production savings up to 5% on your water heaters. Feeler bulb attaches to outside of tank, avoiding need for well or hole in tank. Has safety shutoff. Handles all gasses. AGA listed.



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Add A-P Dependability to your Gas Fired Appliances.

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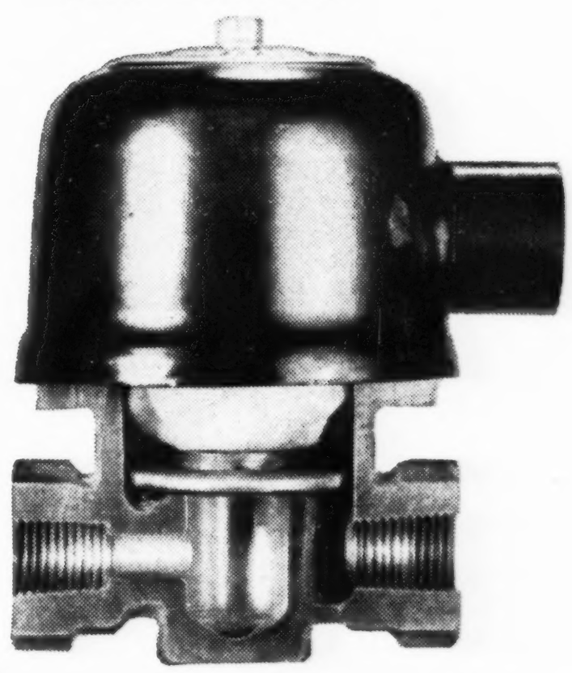

Cross section showing plunger shield and composition seat

Solenoid Gas Valve for furnaces
Non-gumming, positive-sealing

There's no gumming or sticking in this new A-P Model 162 Gas Solenoid. Unique plunger shield keeps gas impurities away from plunger parts. New flexible composition valve disc seals positively on all gasses. Lasts longer, operates more efficiently. AGA Listed. Available with fan switch, limit control, electric automatic pilot, transformer, terminal board — all built into streamlined case.

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DEPENDABLE CONTROLS
FOR HEATING . . . AIR CONDITIONING . . . REFRIGERATIO

ratios, and inferred that all was well.

The commission closed its attack by saying, ". . . the natural gas pipeline industry as a whole is conservatively capitalized . . . current earnings on equity capital are very favorable and . . . equity capital is being invested to meet, in part, the large construction program which has been under way since the close of the war."

Restrictions Refused

Massachusetts' Public Utilities Department a few weeks ago turned down proposals asking restrictions on the sale of gas for house and space heating. Demands had been made on the department to require gas companies to cut down customers in those categories where higher rates for all customers were needed to maintain "promotional" rates for house and space heating. The department declared that it had no legal right to interfere with the administration of the gas companies' business, and that the courts were available for recourse of anyone injured by the utilities' conduct.

The department declared, ". . . it does not seem necessary to compel any company which has an available supply of gas to refuse to deliver to any customer regardless of the purpose for which the customer desires to use it."

WHEN GAS LAMPS WERE MODERN . . .

Back in the "good old days," when lamps were lit with gas, Iron Sponge was the *modern* gas-purification material. Today, the old lamp-lighter is gone, but Iron Sponge is still up-to-date—still the most efficient and economical purifying medium obtainable.

For over 74 years, Iron Sponge has retained its leadership because of these advantages . . . extra high activity and capacity, maximum absorption, longer periods between necessary recoverings, fast comeback, low initial cost, and low maintenance costs, ideal for high or low pressure purification and high or low H^2S concentration or mere traces.

Connelly's experience and engineering facilities are at your service. If your problem is gas-purification, consult Connelly.

Other Connelly products include:

CALOROPTIC
A simple, inexpensive instrument for continuous direct readings and BTU control applied to manufactured, natural, propane, and butane air gas.

SMYLY H2S TESTER
A patented device for quick, accurate tests using pre-treated paper discs.

CONNELLY pH TEST KIT
A complete simple outfit for making pH determinations. Includes universal indicator solution, test tubes, color chart and full directions. Handy 3" x 5" pocket carrying case.

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MISCELLANY

Sendout: 1,050,000,000

People were fashioning snow men in Hollywood, skiing in Pasadena, and shovels were busy everywhere. The record cold spell and snowfall in the Los Angeles basin area started a rush of activity, nowhere greater than in the offices and operating facilities of the SoCal and SoCounties gas systems.

Their integrated lines carried a record 916 MMcf on Jan. 4, and then knocked that record silly on Jan. 10, when the day's send-out zoomed to 1050 MMcf. The companies were forced to curtail interruptib'e service to industries, including oil refineries, and to draw on all available sources of supply to meet the demand.

In a ¼-page ad in local papers, under the heading, "Some thoughts after digging ourselves out of the snow," the two companies explained where the gas came from. The record shows:

448 MMcf from normal sources of supply.

230 MMcf from Texas and New Mexico fields via the Biggest Inch.

257 MMcf from underground storage reservoirs.

115 MMcf "made available to us by oil producing companies who normally channel this gas into their own field for refinery uses or pump it back into their wells to rebuild underground pressures."

St. Louis Gas Strike

Last minute negotiations settled the December wildcat St. Louis gas strike after a number of workers had walked off their jobs at the Laclede Gas Light Co. Credit for speeding the parley has been given to Mayor Kaufmann of St. Louis, who stood by to take emergency action if needed, and Governor Donnelly, who was ready to act under Missouri's King-Thompson law which bars strikes and authorizes seizure and operation of public utilities.

CIO chiefs of the United Gas, Coke & Chemical Workers' Union stated that the walkout was "An absolutely spontaneous gesture resulting from the company's grossly inadequate wage offers."

A union 30-cents-per-hour demand was dropped to 16 cents as negotiations progressed; final settlement gave the unions a 13 cents boost. The company had previously offered 10 cents with an additional 6 cents to be submitted to arbitration.

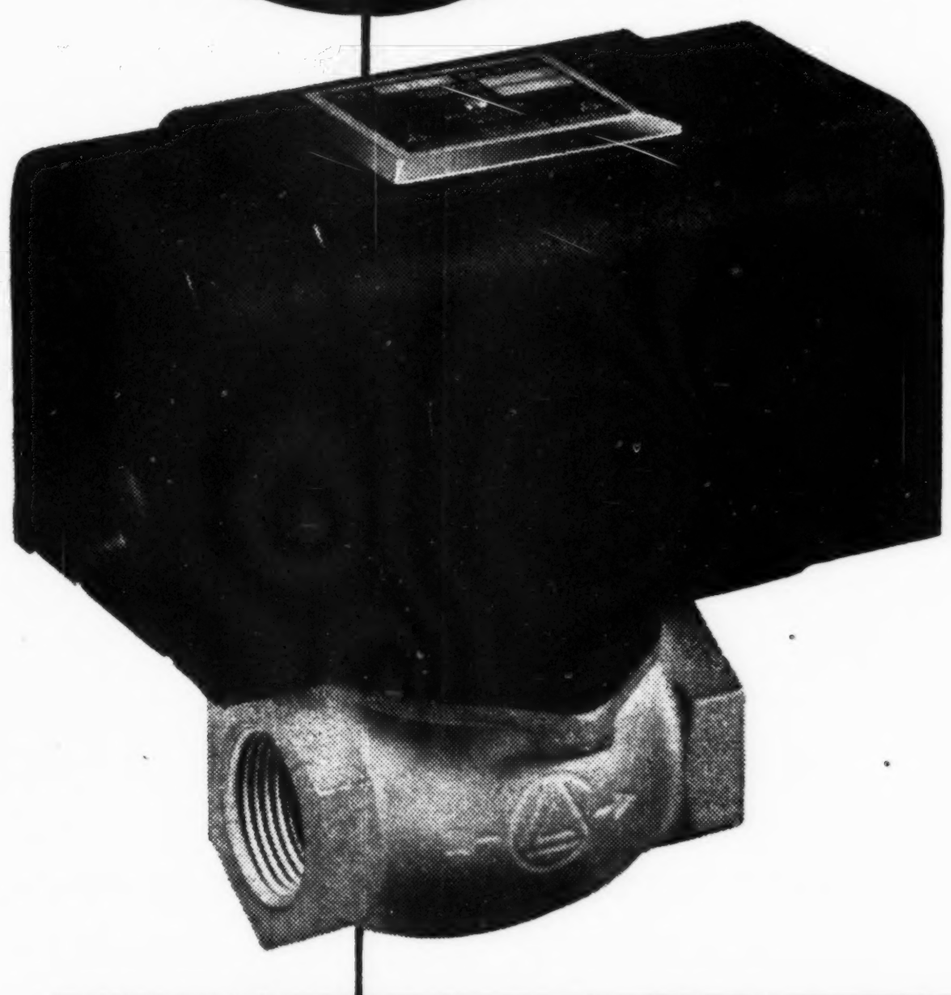
Underground Storage

The inventors of a system for the underground storage of natural gas in pipe under high pressure have established a royalty rate of 60 cents per Mcf of gas storage capacity for users of their system. D. V. Meiller and M. G. Markle, inventors of the system, are associated with the Public Service Co. of Northern Illinois, Chicago.

The Illinois company has established facilities to hold 95 MMcf at 2240-lb pressure using the inventors' method, and plans to boost this capacity to more than 141 MMcf by the end of the year.

"Detroit" V-570 GAS VALVE

EXCLUSIVE STEP OPENING ASSURES FAR BETTER BURNER OPERATION



The "Detroit" V-570 Gas Valve assures better, quieter burner operation. When the thermostat calls for heat, the valve opens partially by snap action. After about 10 seconds to warm the stack and establish draft, the valve opens gradually to full gas flow. Noise and surging are eliminated. This step opening is an exclusive "Detroit" feature.

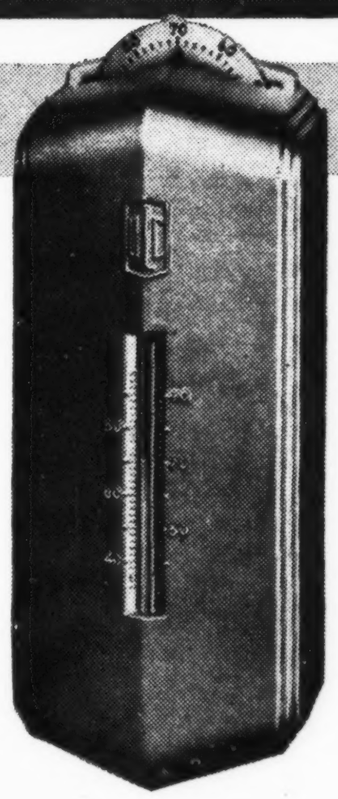
No click or hum—operation of valve is quiet. Closing is positive—valve closes to step position, then snaps off.

Operates on low voltage—installation and wiring are easy. Simple sturdy design—easily opened for cleaning without breaking pipe connections. Sizes ½" to 1¼".

Write for Catalog No. 300 on "Detroit" Control Systems for Automatic Gas Heating.

ACCURATELY COMPENSATED TEMPERATURE CONTROL

"DETROIT" NO. 411 CH THERMOSTAT



Heat compensation feature eliminates costly overheating—minimizes "cold 70". Heating cycle easily varied for condition of each installation by means of patented adjustable compensating heater. Also available without heat compensation. An exceptionally sensitive, durable thermostat.

2510

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"Detroit" Heating and Refrigeration Controls • Engine Safety Controls • Safety Float Valves and Oil Burner Accessories • "Detroit" Expansion Valves and Refrigeration Accessories • Stationary and Locomotive Lubricators

PEOPLE

A. D. Matarese
. . . Brockton

Earl A. Munyan
. . . Atomic Energy

E. G. Dahlgren
. . . Ex-IOCC

George Bowersox
. . . Coast Counties

A. D. MATARESE, vice president of the Brockton (Mass.) Gas Light Co., has been elected a director of the company and named general manager. The election took place at the 1949 organization meeting of the directors held Jan. 5. Mr. Matarese, a graduate of Massachusetts Institute of Technology, joined Brockton Gas Light as a student engineer in 1926. He was named manager in 1935 and elected a vice president a year ago.

EARL A. MUNYAN, prominent in many phases of the gas industry since 1910, is now chief of the Natural Gas Branch, Engineering Division, of the Atomic Energy Commission at Oak Ridge, Tenn. Mr. Munyan began his career with the United Gas Improvement Co. in Philadelphia. In 1916 he joined the DuPont company at Hopewell, Va., and rejoined United Gas Improvement in 1919 after serving in the Navy during World War I. The list of organizations with which Mr. Munyan has been associated since 1920 is impressive: Allentown-Bethlehem Gas Co., Northern Indiana Gas & Electric Co., Logan County Coal Corp., Columbia Gas & Electric Corp., United Fuel Gas Co., and the Institute of Gas Technology. In 1944 he attended the Harvard graduate school of business administration and later that year entered government work with the U. S. Army Air Technical Service in Boston. For a time he served the Reconstruction Finance Corp. and the War Assets Administration, both in Boston. From early 1947 until his appointment to the Atomic Energy Commission, Mr. Munyan was an engineer in the process division of Stone & Webster Engineering Corp., Boston.

E. G. "TY" DAHLGREN, assistant secretary of the Interstate Oil Compact Commission, resigned Jan. 1 to enter private consulting practice in Oklahoma City. A geology graduate of the University of Wisconsin in 1929, Mr. Dahlgren served in various capacities with the Indian Territory Illuminating Oil Co., Oklahoma City Producers' Assn., Oil & Gas Conservation Dept. of the Oklahoma Corporation Commission, Kansas State Corporation Commission, Securities & Exchange Commission, the Petroleum Administration for War, and finally the IOCC. He is presently chairman of the production review committee of the Petroleum Division, American Institute of Mining & Metallurgical Engineers.

GEORGE BOWERSOX has been appointed by Coast Counties Gas & Electric Co., Santa Cruz, Calif., to fill a newly created position as assistant regional manager of the Contra Costa region. He will work with R. L. Hayden, vice president and regional manager, in overall administration of company activities in Contra Costa county. Mr. Bowersox served in engineering and sales capacities with Southern California Gas Co. from 1923 to 1929. Then he joined the Knapp Furnace Co. and opened a San Francisco office for Knapp in 1929. Later he was associated with Natural Gas Equipment Co. in Los Angeles until May 1936, at which time he joined Arrowhead & Puritas Waters Inc. He was serving as general sales manager of the Arrowhead company at the time of his recent appointment.

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MACNICK
UNIVERSAL
CHART
CLOCK
10 ROTATION SPEEDS
Converter gears requiring no tools to install, changes the clock from 24 hour rotation to any one of 10 different chart rotation speeds. Adapters are available to fit the Arcco Macnick Chart Clock to practically every make of recording guage.
Hermetically Sealed
The clock has been engineered to insure accurate operation under all field conditions. The case, made in two parts, is joined and hermetically sealed by a tightly fitting neoprene gasket of special design which protects against moisture, dust or corrosive gases. Price $10.50 fob Los Angeles or Tulsa.
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were installed recently in one home development.* Here's more cash evidence that you can make big sales in the new home construction field.

PS: If you are not a WARD dealer it is profitable to be one. WRITE US TODAY.

* NAME ON REQUEST

Contractors, home project developers and individual owners are all looking for quality heating installations that meet their low budget demands.

Many Ward dealers are cashing in on this great all-year market. They are beating the competition with WARCO Furnaces that provide plenty of heat, luxury features and a five-year guarantee at the lowest comparative cost.

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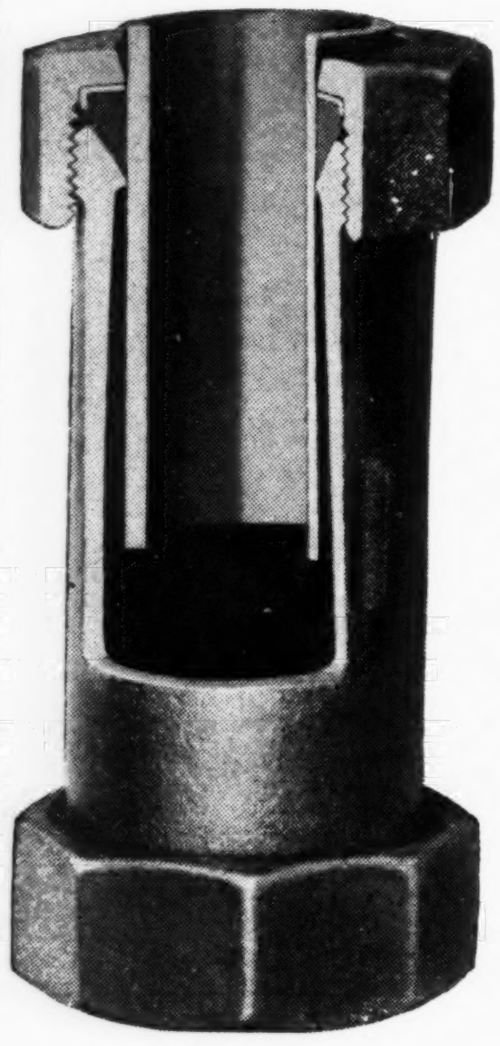
NORMAC
COUPLINGS, SLEEVES and FITTINGS



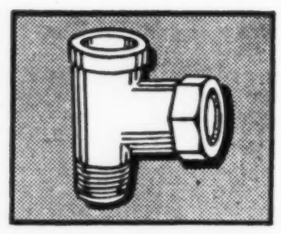
for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.

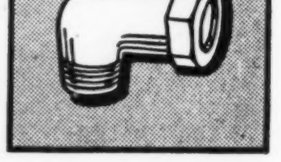
COMPRESSION-END SERVICE "TEE"

First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.



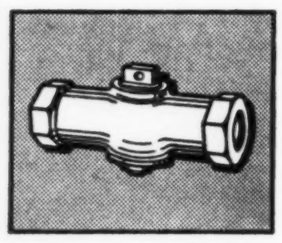
COMPRESSION-END SERVICE "ELL"

Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.



COMPRESSION-END IRON BODY BRASS CORE SERVICE STOPCOCKS

End the necessity of threading on the job plus the elimination of the threads themselves — combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.



NORMAC BRASS FITTINGS DEVELOPED IN 1939 FOR USE WITH COPPER TUBING

Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

39 SOUTH LA SALLE ST. • CHICAGO 3, ILLINOIS

Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

CRAIG ESPY, widely known in the natural gas and butane-propane industries, is again a staff member of *GAS*. He started with *GAS* in 1926 and helped to establish BUTANE-PROPANE *News* in 1939, representing both books nationally in the advertising and editorial departments. In 1945 he resigned and lately has been associated with the *Oil and Gas Journal* in Tulsa.

Mr. Espy will represent Jenkins Publications Inc. in Texas, Oklahoma, Kansas, Arkansas, and Tennessee and will have his headquarters at 2519 S. Harvard Court, Tulsa. He was so long identified with *GAS* and BUTANE-PROPANE *News* in the states named that he will be thoroughly at home. Actually, he will be merely picking up his work where he left it a few years ago.

Frank Wills

FRANK WILLS, engineer of production in the gas department of Pacific Gas & Electric Co., San Francisco, retired Jan. 1 under provisions of the company's pension plan. Mr. Wills joined PG&E in 1918, was employed by the California Railroad Commission from 1920 to 1922, and returned to PG&E in 1922. He served as chairman of the Pacific Coast Gas Assn.'s technical section in 1926 and was awarded the association's Medal of Honor and Gold Medal in 1932.

WILLIAM J. TOBIN has been appointed by Dearborn Chemical Co., Chicago, as sales representative in the Minnesota territory, succeeding the late A. A. Turner. ROY O. BENSON, a member of Dearborn's laboratory and research staff for the past 11 years, is now sales representative in the Chicago territory formerly covered by E. W. HOUSEKNECHT. The Wisconsin territory has been assigned to Mr. Houseknecht, and his headquarters will be at Appleton, Wis. E. STEWART CARLSON, formerly of the *Chicago Tribune,* has been added to the company's advertising staff.

FRANK J. WHELAN, vice president of Worthington Pump & Machinery Corp., Harrison, N. J., has assumed supervision of the sales of welding positioners and turning rolls manufactured at the firm's Dunellen Works. Mr. Whelan will continue to supervise the sale of standard pumps, compressors, and mechanical power transmission equipment sold through industrial and oil field distributors, as well as sales to original equipment manufacturers.

JAMES F. OATES JR., chairman of the Peoples Gas Light & Coke Co., Chicago, was elected chairman of the board of Natural Gas Pipeline Co. of America and Texoma Natural Gas Co. at a directors meeting late in December. Peoples Gas recently acquired all the capital stock of the other two companies.

JOHNZEY KEETH recently was appointed district sales representative in the state of Florida for Caloric Stove Corp. Mr. Keeth has been an LP-Gas dealer, a heating engineer on government projects, and a wholesaler and retailer of gas ranges.

CHARLES G. BARNDT, former sales supervisor for Lone Star Gas Co., Dallas, in the company's West Texas division, has been appointed Oklahoma division superintendent with headquarters at Sulphur. He replaces J. Y. Wheeler who retired Nov. 30 but is being retained as a special representative in Oklahoma. Mr. Barndt joined Lone Star in 1935 and worked as a salesman before becoming district manager of distribution properties at Sulphur. After a stretch in the Army, he returned to Lone Star in 1946 as assistant sales supervisor and later sales supervisor in the Abilene distribution division.

C. G. Barndt
. . . Lone Star

Dick Jenkins
. . . Clark Bros.

DICK JENKINS has been appointed to Clark Bros. Co. Inc.'s Los Angeles technical service department. He joined the company in 1948 and went to the Los Angeles office after doing research in the plant at Olean, N. Y. Mr. Jenkins entered Yale in 1942 and joined the Army in 1943. After three years in the service, during which he received a number of decorations, he returned to Yale and was graduated in 1948.

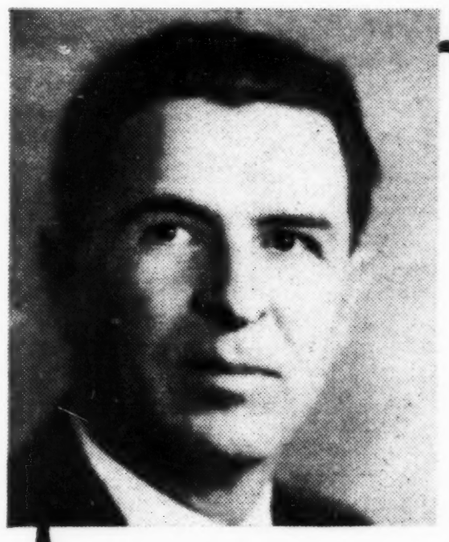
C. FRED LUCAS has been appointed general sales manager of Florence Stove Co. to succeed Robert H. Taylor, who recently became president. Mr. Lucas, who has served as sales manager of the company's southern division, took over his new position Jan. 1 with headquarters at the Gardner, Mass., plant. EDWIN A. BAILEY, salesman in the North Carolina territory, succeeds Mr. Lucas in the southern division, working out of Atlanta, Ga.

JIM HUITT has been awarded the Magnolia Fellowship which was recently established in the School of Chemical Engineering at the University of Oklahoma. Mr. Huitt, a Louisiana Polytechnic Institute graduate, served in the Army and then began graduate work toward a Ph.D. in chemical engineering in 1947.

EDWARD E. HILL, assistant to the executive vice president, Consolidated Edison Co. of New York Inc., has been elected for a three-year term to the board of trustees of Polytechnic Institute of Brooklyn. Mr. Hill will serve on the board as the representative of Polytechnic's alumni.

ANDREW K. FOULDS, patent counsel for two subsidiaries of the American Radiator & Standard Sanitary Corp., has been appointed patent counsel for the entire corporation. He succeeds C. G. HEYLMUN, who has retired.

H. L. FRANCIS has been appointed eastern traffic and transportation manager for Koppers Co. Inc., Kearny, N. J. Mr. Francis also will continue his present duties with the Gas and Coke Division.



W. M. LITTLE
General Superintendent
Gas Distribution
Arkansas Louisiana
Gas Company

"We needed a machine that would dig a narrow ditch, be light weight, and easy to transfer from job to job"

Among other factual statements of performance of the Longhorn Mobile Ditcher, Mr. Little said this in a recent letter: "We have been using one of these machines in the construction of gas distribution mains and services. The operating cost of the machine is approximately 2.5 cents per foot, and the maintenance cost is approximately 1.7 cents per foot, giving us an overall trenching cost of 4.2 cents per foot, not including depreciation. The machine moves from job to job under its own power on rubber-tired wheels at a rate of 10 to 15 miles per hour. We think it is a machine that fills a need in the distribution operations."

Longhorn Mobile Ditcher

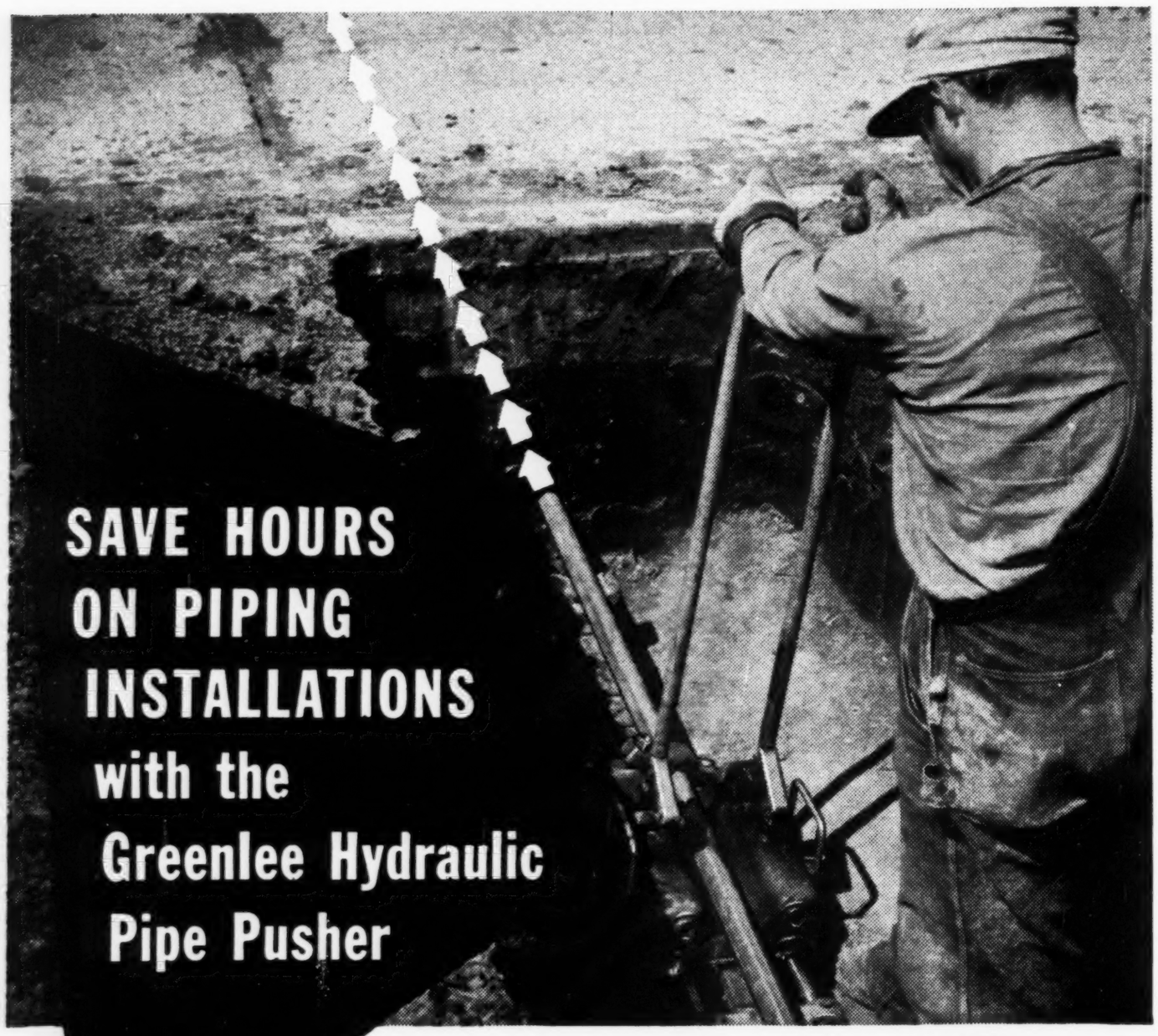
on the job for Arkansas Louisiana Gas Company

These action photographs show a Longhorn Mobile Ditcher digging trench 40" in depth at a rate of 7 linear feet per minute. The Arkansas Louisiana Gas Company owns 3 Longhorn Mobile Ditchers.

Telephone, Wire, or Write for Complete Information

Longhorn Industries, Inc.

Henderson, Texas **Phone 1035**



SAVE HOURS ON PIPING INSTALLATIONS with the Greenlee Hydraulic Pipe Pusher

. . . and a Greenlee Hydraulic Pipe and Conduit Bender

Yes, let a GREENLEE Hydraulic Pusher help speed and simplify your underground piping jobs. With it one man *pushes pipe* under streets, railways, walks, flooring and other obstacles. You eliminate extensive ditching . . . no tearing up of concrete, lawns, floors . . . no backfilling, tamping, tunneling, repaving. Two models: one for pipe up to 4″ and one for larger pipe, ducts, concrete sewer pipe.

You'll also save greatly on labor and material costs with a GREENLEE Hydraulic Bender on your jobs. One-man-operated. Makes smooth, *accurate* bends in just a few minutes—in pipe and conduit up to 4½″, tubing, bus-bars. Compact, portable. Get facts now on these *timesaving* GREENLEE tools which often pay for themselves on the first few jobs.

TOOLS FOR CRAFTSMEN

GREENLEE

WRITE GREENLEE TOOL CO., 1942 COLUMBIA AVE., ROCKFORD, ILLINOIS
for complete data on the above equipment as well as GREENLEE Spiral Screw Drivers • Auger Bits • Expansive Bits • Plumbers' Sets • Hand Benders and many other high quality tools.

J. C. CHISLER, vice president of Hope Natural Gas Co., has been assigned the task of studying all phases of economic problems and personnel changes necessitated by the firm's expansion during the past few years. The announcement was made at the semi-annual meeting of the company's Management and Employee Representatives' Assn. at the home office in Clarksburg, W. Va. At the same time J. C. CROSS was elected as treasurer of Hope Natural and The River Gas Co. and was named to the board of directors of both companies. BURTON E. BRIDGE and WALTER M. KINLEY were promoted to assistant treasurers of the Hope and River companies. Also elected to the board of directors of Hope Natural was E. H. TOLLEFSON, general superintendent. H. R. LIVINGSTON, assistant treasurer of Hope Natural and associated companies, retired recently after 36 years of service.

ARTHUR B. HAMILTON has been appointed general superintendent in charge of all operating departments at The Hartford (Conn.) Gas Co. and RICHARD B. BARGER has been named assistant general superintendent in charge of customer service. Mr. Barger also will act as general superintendent in Mr. Hamilton's absence. Both are mem-

R. B. Barger

A. B. Hamilton

bers of the AGA and the NEGA, and Mr. Barger is presently a director of the latter association's operating division. Mr. Hamilton has been associated with Hartford Gas since 1922 and Mr. Barger since 1935.

NEAL BREWSTER, Syracuse, N. Y., filed application last month for retirement as a member of the New York Public Service Commission as of Jan. 31. MILO R. MALTBIE, veteran chairman of the commission, has applied for retirement, and the term of MAURICE C. BURRITT, who has said he does not want reappointment, is expiring. There is a great deal of interest in Governor Dewey's selections for the vacancies because the reorganized commission is expected to act upon many utility requests for rate increases.

ALBERT E. MYERS has been appointed superintendent of gas control for The Cincinnati Gas & Electric Co., taking over some of the work formerly handled by William K. Backer, general superintendent. Mr. Myers will be responsible for the dispatching of gas to the system and the metering of gas out of the transmission measuring station.

R. A. BISSELL has been appointed assistant sales promotion manager of the Bryant Heater Co. Mr. Bissell, formerly a sales representative in the New York office, has moved to Bryant's headquarters in Cleveland, Ohio. J. H. SWALLOW, St. Louis branch manager for three years, has been promoted to sales manager of the company's southern district.

E. ALLEN BROWN, superintendent of production for Lone Star Gas Co., Dallas, on Jan. 1 became manager of the new exploration and gas supply department. Mr. Brown will direct and coordinate activities of the land, geological, and production departments. Other promotions include: J. PAUL ROGERS, from assistant field supervisor of production to exploration engineer; CARL M. HILL from chief production engineer to superintendent of production department; M. O. ATTEBERY from field supervisor of production to assistant superintendent of production; and W. M. BURKE from assistant chief production engineer to chief production engineer. In the Abilene division of distribution, Supt. M. L. Bird announced the appointment of C. Y. SMITH and GORDON DAVIS as dealer assistance sales supervisors.

E. H. Selecman

EDGAR H. SELECMAN, member of the legal staff of Lone Star Gas Co., Dallas, for 20 years, resigned to accept a position on the executive and legal staff of the Shamrock Oil and Gas Corp. in Amarillo. He assumed his new duties Jan. 3. A native of Rochester, N. Y., he attended Northwestern University, University of California at Los Angeles, and Southern Methodist University, Dallas. He joined Lone Star's legal department in 1929 and had previously been associated with the law firm of Lively & Daugherty in Dallas.

WILL A. RYAN, Memphis, Tenn., has taken a position as chief gas inspector for the city. Mr. Ryan will be in charge of a three-man group which will inspect all new installations of gas heating equipment. He has worked with gas heating for 27 years, 17 in the engineering and sales department of the gas division of Memphis Light, Gas & Water Division and its predecessor. For the past 10 years he has been selling gas equipment and instructing installation crews. HAROLD T. REED, former gas fitter for the Memphis utility and more recently in the gas equipment installation business himself, has been selected as one of the inspectors, and the third has not been named.

DEAN M. WORKMAN recently was appointed by Ebasco Services Inc., New York, as consulting gas engineer in the planning, design, operation, and betterment of manufactured and natural gas systems. Since he joined Ebasco in 1937, Mr. Workman has conducted studies and investigations pertaining to all phases of gas operations. He also has engineered a number of projects for a diversified group of utilities.

FRANK E. EARLY recently was appointed representative in the Detroit area for Askania Regulator Co., Chicago. Mr. Early, who has worked with Askania equipment in various capacities since 1936, will represent the company for all its products.

ROBERT R. JOHNSTON, superintendent of the Kansas City, Kan., division of The Gas Service Co., retired Dec. 1. ESTILL M. ANDERSON, assistant superintendent of the company since 1920, replaced Mr. Johnston.

Freedom of choice
WITH R-C dual-ability
CENTRIFUGAL
H-186-A
One of a battery of three type H, multi-stage R-C Centrifugal Blowers; each direct-coupled to 700 HP motor; capacity of each blower is 15,000 CFM.
ROTARY
1135
R-C Rotary Positive Blower, variable speed, 400/200 RPM; capacity is 12,000 CFM.

You're not confined to just one type of blower or exhauster when you bring your air or gas handling questions to us. That's because we build both Centrifugal and Rotary Positive units. You can specify the equipment best suited to the specific job. We are the only blower manufacturer offering this *dual choice.*

R-C *dual-ability* delivers other advantages. Our extensive lines of Centrifugal and Rotary Positive types enable you to match capacities, pressures and other characteristics closely to your requirements—resulting in economies both in first cost and in operating cost.

You can bank on the performance of R-C Blowers, too. Building equipment for handling air and gas has been our only business for almost a century—so we *must* give complete satisfaction to every customer.

ROOTS-CONNERSVILLE BLOWER CORPORATION
902 Oregon Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE

BLOWER BUILDERS • R-C • SINCE 1854

BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

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THE GOLDAK *Featherweight* MODEL 87

PIPE LOCATOR

FINDS THOSE PIPES!

- Gives EXACT location of buried pipes, mains, services, gates, tees, ells, stubs, etc.
- Easy, reliable one-man operation
- Compact, ruggedly built
- Featherweight — only 11 lbs. complete
- Guaranteed superior performance

WRITE FOR COMPLETE DETAILS

THE GOLDAK CO. 1542 W. GLENOAKS, GLENDALE 1, CALIFORNIA

SHOW OVEN HEAT

TO PROMOTE SALES . . . Visually demonstrates advantages of better constructed, better insulated ovens.

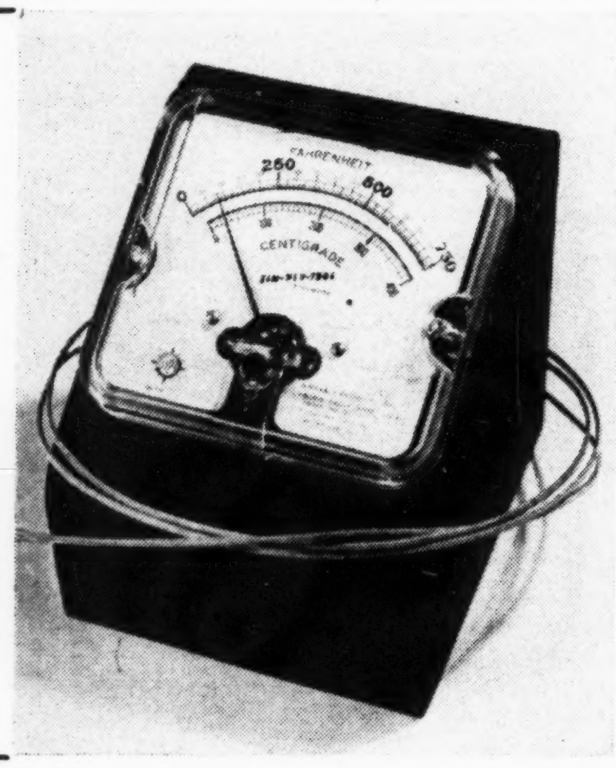
TO SPEED SERVICE . . . SAVES up to 30 minutes on service and adjustment of oven controls.

The SIMPLYTROL Oven Thermometer for accurate reading of oven temperature without opening oven door. Reads up to 750°F, or 400°C.

Model 1654-A, illustrated.....$21.00
(Complete with thermocouple wire)

Order today, or write Dept. G-1

ASSEMBLY PRODUCTS, INC.
CHAGRIN FALLS, OHIO



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NAME_____ POSITION_____

COMPANY_____

_____

STREET CITY ZONE STATE

RUSSELL E. GARDNER JR., of the investment firm of Reinholdt & Gardner in St. Louis, has been elected a member of Laclede Gas Light Co.'s board of directors to fill the vacancy created by the death of William C. D'Arcy, advertising executive. Robert W. Otto, Laclede's president, said the company is continuing its policy of selecting local businessmen to serve on its board.

BROWN BOOTH, public relations director for Tennessee Gas Transmission Co., Houston, for the past three years, resigned recently to accept a position handling public relations and advertising for Brown & Root Inc. of Houston. Mr. Booth is succeeded at Tennessee Gas by CONRAD COLLIER, former publicity director for the Houston Chamber of Commerce.

- OBITUARIES -

STANTON G. KRAKE, 79, owner and publisher of the *American Gas Journal,* died Dec. 21 at his home in Brooklyn. Mr. Krake was very prominent in the gas industry for 24 years. Born at Briar Hill, N. Y., he went to New York City in 1893. After serving as a publisher's representative for a number of industrial publications, he became owner of the *American Gas Journal* in 1924. The magazine was changed from a weekly to a monthly in 1927.

PAUL R. JOHNSON, prominent in the oil and gas industry, died at Independence, Kan., on Dec. 17 after a brief illness following a heart attack. For more than 20 years Mr. Johnson had served as president of Union Gas System Inc. and its producing subsidiary, the Sagamore Oil & Gas Co. He was also the directing head of a number of other businesses including several engaged in the distribution of liquefied petroleum gas and the distribution of gas appliances.

OSCAR B. CUSTER, 56, head of Lone Star Gas Co.'s stock transfer office in Dallas, died Dec. 17. Mr. Custer went to Dallas in 1921 to assist officials of Ohio Fuel Gas Co. in making an audit of Lone Star properties. He remained with the Texas utility and held a number of positions in the years that followed, including that of office manager of Northwest Cities Gas Co. in Walla Walla, Wash., once a Lone Star subsidiary.

W. WALLACE KEMP, president of the C. M. Kemp Manufacturing Co., Baltimore, died recently at his home there. Mr. Kemp, who had succeeded his father, founder of the company, had served as president and chairman of the board of directors since 1912. In 1920 Mr. Kemp was awarded the Edward Longstreth Medal of Merit from the Franklin Institute for development of gas producing apparatus and an automatic gas system.

PHILLIP L. CLARKE, a member of Southern California Gas Co.'s engineering staff for the past 16 years, died recently in Glendale, Calif. Mr. Clarke was a technical graduate of Purdue University and was formerly chief engineer of several mining and production projects in Mexico, Cuba, and Peru.

ERNEST G. JONES, a sales representative for the Elizabethtown Consolidated Gas Co., Elizabeth, N. J., for 15 years, died recently after an illness of several months. He was 67 years old.

SALES SLANTS

Court of Flame in Session

To the accompaniment of jingling pocketfuls of prize money, water heater salesmen throughout the nation last month launched into a loud chorus of their theme song for 1949: "For hot water magic—Gas Has Got It!" GAMA's heralded "Court of Flame" program was officially under way, and the thousands of salesmen were beginning to tot up sales that would mean money in the pocket—and in the bank—for many of the most conscientious. The program's aim: to sell 2 million automatic gas water heaters in 1949.

Gas water heaters, meanwhile, came out from behind the rags that once made them the Cinderella of the appliance business, and were clothed with new glamor which included the most stunning ensemble of all time —the biggest national advertising campaign yet conducted jointly by GAMA, the AGA, and manufacturers. The munificent outlay follows 1948's big feature show on gas ranges, which is being continued in the current year.

The key that is going to open the door to these 2 million sales is upgrading. Adver-

tising and sales promotion plans are being formulated on this basis—to replace worn-out, poorly functioning, and inadequately sized water heaters.

Both dealers and their salesmen and merchandising utility salesmen are eligible to compete in the Court of Flame contest. Two separate categories have been established, and each has been broken down into divisions—in the gas industry, number of meters served by the company is the criterion for dividing the contestants.

Top salesman in each of the categories will win a 1950 Buick Super sedan. Divisional awards will range from $1000 savings bonds to $50 bonds, with 10 winners in each category. This will be further broken down into quality of sales—for those selling the most top-quality heaters and for those selling the largest number of heaters in any class. Finally, quarterly prizes will be awarded four times during the year.

The bronze trophy illustrated here will go to the leading company in each classification.

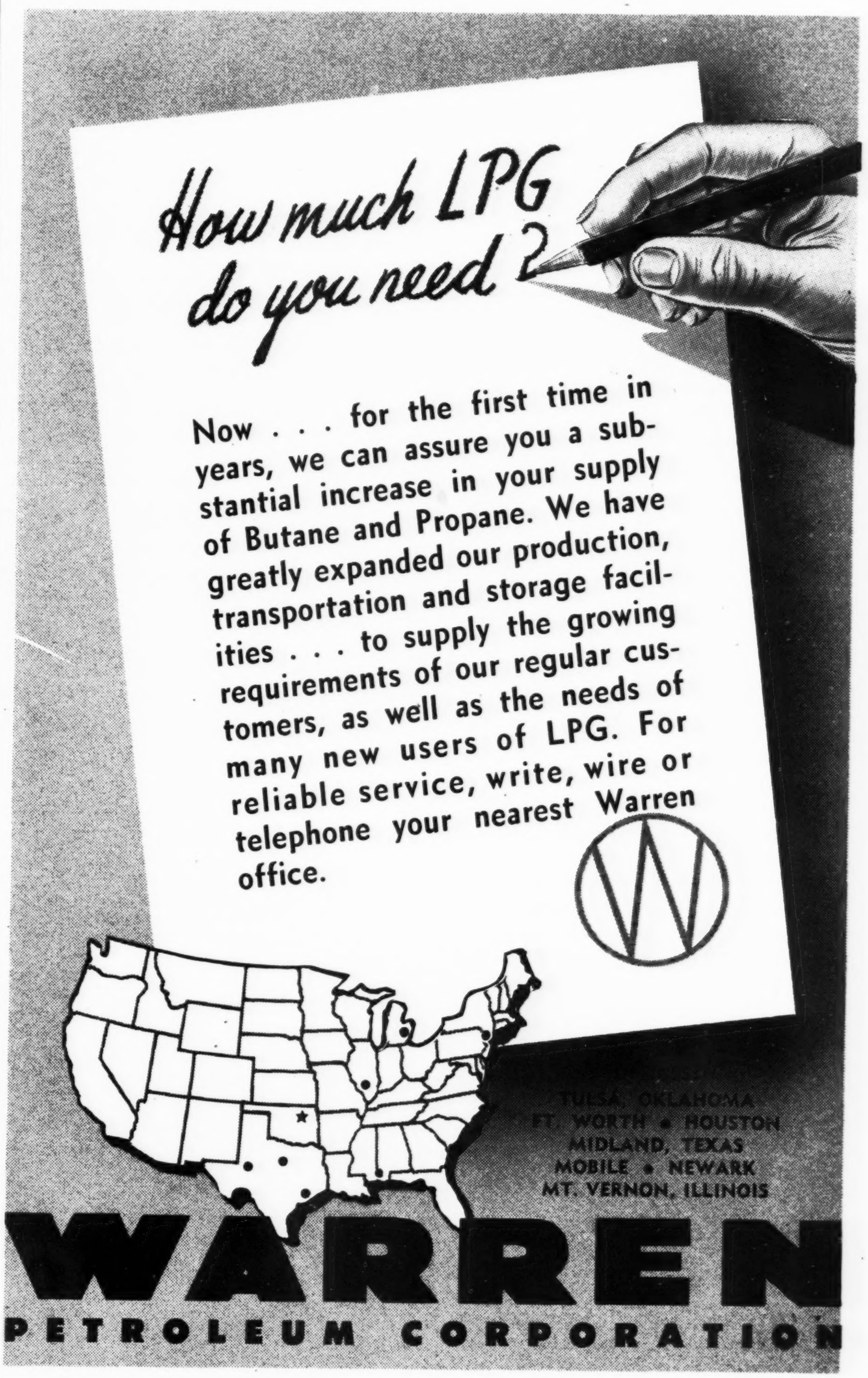
Twenty-eight manufacturers are joining hands in the drive.

THE CALORIC STOVE CORP., Philadelphia, has announced a financing plan for dealers which is expected to help dealers supply consumer demand for gas ranges more efficiently and at less cost. The plan, which applies nationally to all areas on gas lines or using LP-Gas, offers these advantages to dealers:

1. A completely representative line of floor samples at low investment cost.
2. Relief from warehousing problems through selling from floor samples and getting customer delivery from complete stocks maintained at 39 Caloric warehousing points throughout the country.
3. Prompt deliveries to all customers because as sales are made there is no waiting to replenish dealer stocks.

The floor plan financing reduces the dealer's initial capital outlay; he can carry an adequate number of floor samples with an original investment of 20% of their cost. The remainder of the initial cost is carried at a low interest rate for seven months.

HARPER-WYMAN CO., Chicago, recently made a follow-up report on the "Cook With Gas" contest held at the AGA convention in October (See *GAS*, Nov. p. 88 and Dec. p. 83). The company sought an answer to the


How much LPG do you need?
Now . . . for the first time in years, we can assure you a substantial increase in your supply of Butane and Propane. We have greatly expanded our production, transportation and storage facilities . . . to supply the growing requirements of our regular customers, as well as the needs of many new users of LPG. For reliable service, write, wire or telephone your nearest Warren office.
TULSA, OKLAHOMA
FT. WORTH • HOUSTON
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MOBILE • NEWARK
MT. VERNON, ILLINOIS
WARREN
PETROLEUM CORPORATION

UTILITIES CONVERSION CO.

Specialists in Appliance and Equipment Change-overs

If you plan to change the type of gas you are now distributing, contact us for our method.

We are equipped to handle all details and problems of appliance and equipment change-overs.

With our crew of experienced men we supply all tools and equipment to complete the job in the least possible time.

Write, phone or wire for consulting service on your changeover.

5815 29th Avenue South, Minneapolis, Minn.

WANTED

300 MCF per hour fan type gas booster for total boost of 12 inches WC. 125 - 15 lb. steam turbine or 3 ph 60 cycle 440 volt motor drive. Box 150, GAS, 198 S. Alvarado St., Los Angeles 4, Calif.

CHOICE POSITIONS OPEN

A leading marketer of Liquefied Petroleum Gas with offices in Indiana, Illinois, Kentucky, Ohio, Michigan, Pennsylvania, New York, New Jersey and Maryland, requires Sales Supervisors, District Managers and Appliance Salesmen with sales experience. Utility or LP-Gas background preferred, but not necessary. Choice of locations. Our employees know of this offer. Write Box 175, GAS, 198 S. Alvarado St., Los Angeles 4, Calif.

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EQUIPMENT

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FUEL SUPPLY AND CONSULTING SERVICE

UNITED PETROLEUM GAS COMPANY

806 ANDRUS BLDG., MINNEAPOLIS 2, MINN.

question, "How much gas does the average housewife use to keep the contents of a covered vessel at the boiling temperature?"

The convention booth was visited by 1377 persons who adjusted a single burner as they believed it was done in the average home. The average of all these adjustments came o 3197 Btu per hour. In other words, after the full-on burner at 9000 Btu had brought food to the cooking temperature, 1377 gas association delegates believed the burner was turned down to more than one-third of the original rate.

Harper-Wyman says that only 1200 Btu is needed to keep the contents of a covered vessel, generally used in home cooking, at the boiling temperature. Results of the contest seem to indicate that a great deal of extra heat is being poured into kitchens, resulting in discomfort, food wastage, and cooking inconvenience. As a solution, Harper-Wyman offers its double section burner with a Center Simmer that burns independently of the outer ring of flame.

THE GAS APPLIANCE SOCIETY OF CALIFORNIA recently announced the winners in the window display and salesmen's contests held in connection with its fall gas range campaign. Grand prizes in the salesmen's contest went to Arthur P. Lites, McMahan's, Bakersfield; Tom Baker, Baker & Stanton, Eureka; and A. A. Timpson, Good Housekeeping Shop, Oakland. They received U. S. bonds for $500, $200, and $100, respectively.

Breuner's in Oakland nabbed the $75 first prize in the window display contest for District 1. This display is shown in the photograph. Second and third prizes of $50 and $25 were awarded to Feil Radio Service, San Francisco, and Gray Minor, Oakland. In District 2 first prize went to Simoni's Home Furniture, San Jose, and Losher's of Modesto took top honors in District 3.

The window display contest was judged by a committee from the San Francisco Advertising Club.

GAS ENGINEER

Arizona public utility seeks experienced gas engineer with executive ability for distribution system design, load forecasting and associated subjects. Permanent position and excellent opportunity. Give age, education and experience. Address Box 125, GAS, 198 S. Alvarado St., Los Angeles 4, Calif.

RATE CONSULTANT

Preferably graduate engineer, to develop rate structures for natural and manufactured gas; make studies of markets, competition and costs. Location New York; travel involved. Submit complete resume.

Box 25, GAS

198 So. Alvarado St., Los Angeles 4, Calif.

SALES ENGINEER

Permanent position open for chemical engineer, age 25-35, in sales department of prominent organic chemicals manufacturer. Sales background and experience in measurement and distribution of natural gas are required. Considerable travelling involved.

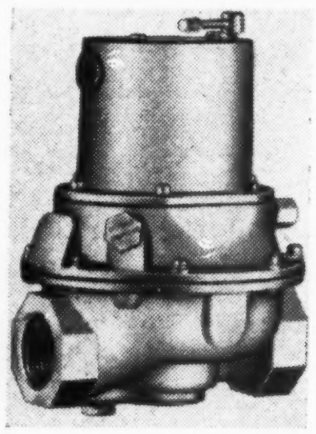
Write Box 100, GAS

198 South Alvarado St.

Los Angeles 4, Calif.

NEW PRODUCTS

Diaphragm Gas Valve



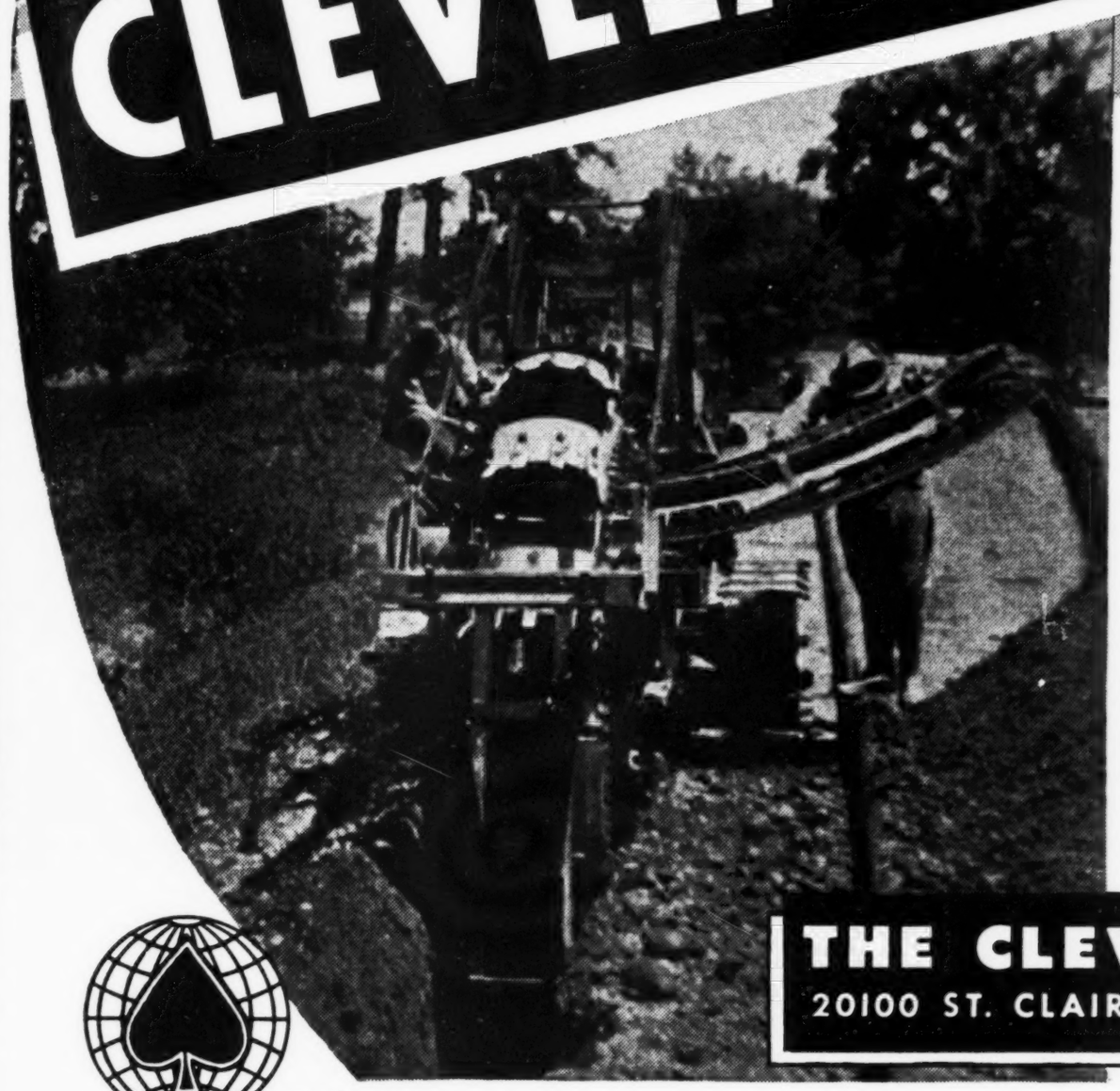
GENERAL CONTROLS CO., 801 Allen Ave., Glendale 1, Calif.

MODEL: B-50 electric diaphragm gas valve.

APPLICATION: Designed for reliable control of natural, manufactured, mixed, and LP-Gases to space and unit heaters, central, floor and wall furnaces, and boilers.

DESCRIPTION: The valve is silent and has no packing glands or bellows to impede operation. Current consumption is low—about 5 watts. Standard model and manual opening model are available with or without electric trip. Envelope size of valve makes it easy and simple to adapt to any gas-fired heating installation. All body parts are of die formed aluminum of high density and tensile strength. There are two small sizes—⅜ and ½ in. ips, 2¾ in. diameter; two medium sizes—½ and ¾ in. ips, 3⅞ in. diameter; and three large sizes—1, 1¼, and

IT'S A CLEVELAND



WHEN THE PRESSURE'S ON ON THE TRENCHING JOB

Whether it's a case of beating a tough schedule or doing the work at minimum costs, you can absolutely depend on CLEVELANDS.

Extremely compact, sure-footed, very fast, easy to handle, with lots of real stamina and plenty of power, CLEVELANDS deliver maximum trench in minimum time.

Because of their correct design, superior quality unit-type construction, ease of mobility and low fuel consumption, CLEVELANDS operating and maintenance costs are consistently low, assuring real trenching economy for the long main lines, distribution lines, short scattered service lines and reconditioning.

THE CLEVELAND TRENCHER CO.
20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

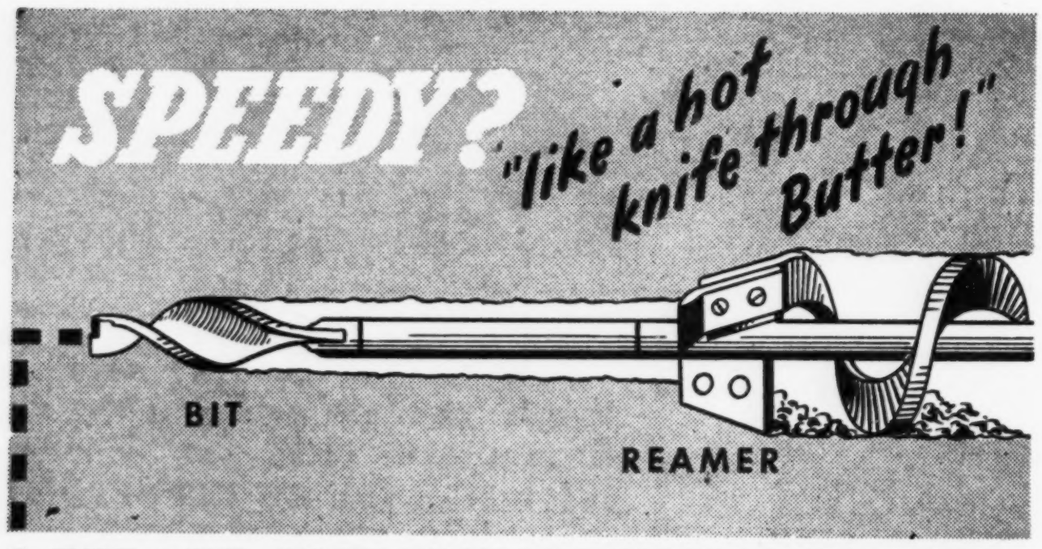
TRADE MARK

6 Reasons why you'll like this ASBESTOS CEMENT *Flue Pipe:*

1. Can't rust—it's made of TRANSITE*
2. Tough and strong
3. Light in weight—easy to install
4. Low heat conductivity—better draft
5. Available in both round and oval shapes
6. A complete line of Transite fittings

*Reg. U. S. Pat. Off.

Johns-Manville
TRANSITE FLUE PIPE
for venting domestic gas-burning appliances



THE LOW COST WAY TO INSTALL ANY PIPE

Even the toughest earth formations, like rotten rock, are no obstacle to Hydrauger operations. In fact, Hydrauger has fewer limitations, especially in time and costs, than trenching; and it is more certain than pipe-pushing, particularly if the pipe is coated, wrapped or of large size.

Write for Catalog No. 8 TODAY!

HYDRAUGER CORP., Ltd.
681 Market Street
San Francisco 5, California

OPEN HOLE

Hydrauger*

*Reg. U. S. Pat. Office

HY-13c

EARTH BORING TOOL

Smart dealers will maintain stocks geared to 1949's NEW Housing demand.

Be ready for this unprecedented volume. Plan NOW. Order NOW. You'll get the business if you have the ready stock.

Be Ready! for NEW HOUSING

GOVERNMENT AND PRIVATE

Keep your stocks adequate for mass sales of Peerless

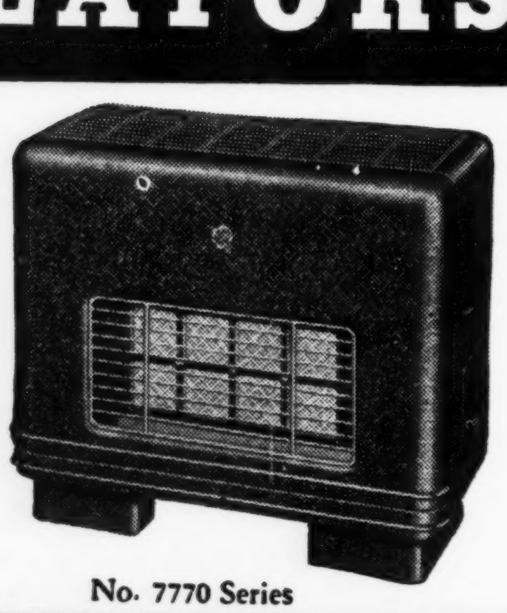
Thousands now in use in Housing developments everywhere. Peerless is a natural for government and private projects.

Sizes and types for every need. With or without automatic controls.

GAS CIRCULATORS

No. 7780 Series

Write for complete catalog on this top quality line . . . sold thru better distributors everywhere.



No. 7770 Series

PEERLESS MANUFACTURING CORPORATION, LOUISVILLE 10, KY.

1½ in. ips, 5¼ in. diameter. The valve is available in a packaged set which includes the new T-70 snap action thermostat, a 9 VA transformer and thermostat cable.

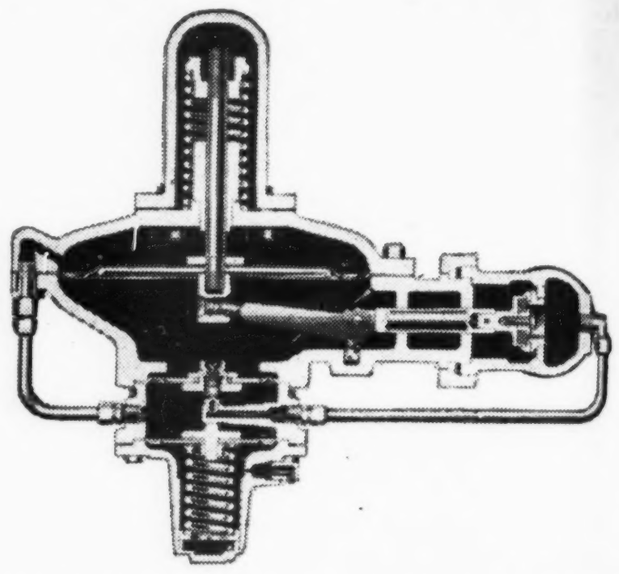
Gas Regulator

FISHER GOVERNOR CO., Marshalltown, Iowa.

MODEL: Type 99 multi-purpose gas pressure regulator.

APPLICATION: This regulator is set to be extremely stable in operation over its entire pressure and volume range, and because of this wide flexibility and broad pressure and flow range, it is intended to serve many installations which formerly required several types of regulators.

DESCRIPTION: Under research and development for the past nine years, the regulator is now available in 2-in. screwed pipe thread connections only, and it is suitable for inlet pressures up to 150 lb and reduced pressures of 4 oz to 50 lb. The capacity range runs from 0 to 143,000 cu ft/hr, and due to special internal and pilot construction it is able to maintain a constant reduced pressure on all flows from zero up to the maximum.



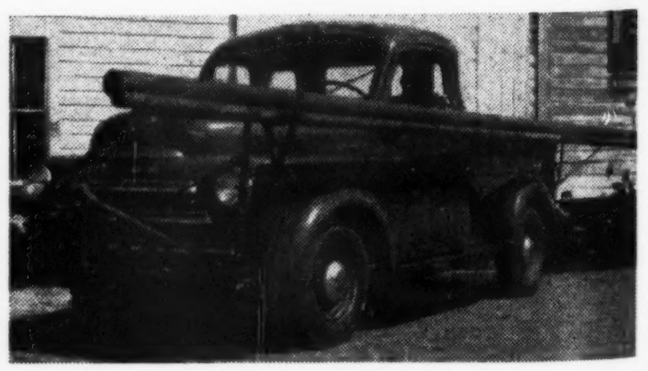
Bulletin P-99, available upon request, gives all necessary data as to capacity, regulation, and pressure ranges.

Pipe and Utility Rack

STEVENS MANUFACTURING CO., Mount Pleasant, Mich.

MODEL: Stemco.

APPLICATION: Designed for Chevrolet, Dodge, Ford, Studebaker, commercial cars, and Willys trucks, this rack will transport pipe, ladders, lengths of steel and timber.



DESCRIPTION: The Stemco pipe and utility rack consists of two strong, sturdily built arms, each with a half-round end. Hinges permit the racks to swing out on either side into carrying position. Low center of gravity makes loading easy, and the overall width with both racks in carrying position is well under the legal requirement. When not used as a carrier, the arms fold down to a triangle to form an attractive and protective grille guard.